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VETERINARY MEDICINE DURING THE PAST FIFTY YEARS

BY

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III. Pioneering Triumphs (continued)

(*Continued from page* 18)

ADVANCES IN PREVENTIVE VETERINARY MEDICINE

The present century opened with the notion among enthusiasts for the new doctrine, as they conceived it had been propounded by the master minds of Pasteur, Koch, Ehrlich, von Behring, Roux and others before the close of the preceding century, that preventive medicine had entered upon an entirely new phase. That new phase was, in essence, that disease, and particularly specific infectious disease, was a process affecting the living body deleteriously which was to be counteracted in general by setting up an *immunity* against it. Two sharply divided classes of immunity were recognised, namely, passive and active: the one a temporary state set up by introducing, parenterally, *antibodies* contained in the blood *serum* of another animal specially *hyperimmunised*; and the other a more durable state produced by inoculating the animal with an *antigen*, in itself harmless, or at any rate non-lethal, consisting of a *vaccine*, comprising either the dead or living "*attenuated*" causative micro-organisms. Where the dead vaccine was ineffective, and an attenuated living culture or other morbid antigen was not forthcoming, then the easy and obvious procedure was to perform a double, or serum-simultaneous, inoculation: this consisted of mitigating the lethal effects of the fully virulent infection induced in the animal by simultaneous inoculation with a potent anti-serum.

Such a simple interpretation, or more correctly, misinterpretation, of the disclosures made by the above master minds wrought, if not far more harm than good—impeding, as it did, advance in several directions—oftentimes much embarrassment to those whose intimate experience with what may be termed the *natural history* of a given disease as it presented itself in a given species, and indeed in a given race within a given species, and again within a given territory, soon compelled departure from these crude conceptions.

Most unfortunately, the path of the pioneer in evolving a workable procedure, to deal with a field problem in a manner likely ultimately to be characterised by the three essential qualities of being firstly, efficacious and durable, secondly, safe, or at any rate not attended by such a high proportion of accidental losses as to cause disquietude to the owner, and thirdly, economical, to the extent that the cost was negligible in comparison with the value of the animal protected, was again bestrewn with difficulties. These difficulties now arose not so much from the former public and official obsession with "cures," but were deriving from those whose intellectual and experiential limitations, impressing themselves all too readily again on officialdom, could not envisage prophylaxis except in crude terms of "*serum*" and "*vaccine*." These obstructions have persisted unfortunately all too commonly till the present day.

There is no need to labour these points further by argument or explanation if we select for merely passing notice, as illustrative examples, a few of the triumphs that have to be recorded to the resounding credit of veterinary preventive medicine during the past 50 years; and, largely too, in defiance of prevailing crude conceptions of the above new doctrine.

Texas Fever in Cattle in U.S.A. and East Coast Fever in South Africa.—Both these diseases are, as is well known to the initiated, piroplasmoses, that is, infections caused by protozoan parasites, of the order, sporozoa, to which order also belong the malarial parasites of man and birds. Nevertheless, as we have long known, the two diseases, which at one time threatened the extinction of cattle raising within extensive territories but have now been happily either eradicated or brought under effective control, notably in the two territories named above, are caused by two different kinds of piroplasms, *Babesia* and *Theileria*, respectively. The two kinds present marked differences in their morphology and cyclical development in the bovine host and vectors, which are well-known species of ticks.

The elucidation of the causation and nature of these diseases has been one of the greatest romances of all medicine; for it revolutionised completely the notions held regarding many other widespread infectious diseases. Even when their causation and nature had been traced, the obsession died hard, in the minds of those preoccupied with the paramountcy of the newer doctrine, that they were such as could be controlled by the "serum or/and vaccine" notions of the late 19th and early 20th centuries.

Writing of the great monograph (now before the present writer) published in 1893 under the names of Theobald Smith, PH.B., M.D., and F. L. Kilborne, B.AGR., B.V.S. (summarised in U.S. Dept. Agric., Bureau of Anim. Indust., 8th and 9th Ann. Repts., 1893, 177–304) the late Dr. William Bulloch, M.D., F.R.S., the historian of bacteriology, said [*J. Path. & Bact.* 1935. **40.** 621–635, Theobald Smith (1859–1934), Obituary], apropos of its place in furnishing proof, for the first time in medical history, of the transmission of disease through the agency of an arthropod vector:—

"Manson's ['the father of tropical medicine'] work on filariasis and mosquitoes (1879) was not quite conclusive although often claimed to be and Bruce's great work on trypanosomes and *Glossina* [*i.e.*, on *nagana* in Zululand, referred to in the preceding instalment] was not done till later still.

"With regard to the value of Smith and Kilborne's research on Texas fever and having read it carefully and critically, I agree with the estimate of de Kruif in his accurate *Microbe Hunters* (1926, p. 250, Amer. Edit.), 'Never—and I do not forget the masterpieces of Leeuwenhoek or Koch or any genius in the line of microbe hunters—never, I say, has there been written a more simple but at the same time more solid answer to an enigma of nature'."

That appraisal, coming from two of the finest modern historians of medical science, would have constituted enough testimony in itself, in the present writer's opinion, to have

warranted the publication of these articles in vindication of the claim of veterinary medicine to have long established a position second to none in the annals of scientific advance.

Without wishing to detract in the least from the merits of Theobald Smith's own contribution to the above advance—for as Dr. Bulloch rightly stated, he probably came to be the master mind in developing it, after becoming converted to Kilborne's view regarding tick transmission—it is well to dwell for a moment on the sequence of events which led to the above fundamental discovery.

Happily, these events have now been well recorded from contemporary testimony by our American colleagues, Drs. L. A. Merillat and D. M. Campbell (*Veterinary Military History of the United States*. 1935. Vol. 1. pp. 174, 300, 382–386). The disease had been reported as spreading northwards from the Southern States as early as the beginning of the 19th century. During the American Civil War (1861–1865) the vast herds of the South-West multiplied beyond computation after the Mississippi River had fallen under the control of the Union forces. After the war ended and the embargo on movement was lifted, cattle from those herds were driven northwards in their countless thousands, spreading with them an overwhelming plague, Texas fever. " No one understood why southern cattle so seemingly healthy could transmit such pestilence, months later, to native cattle merely driven over the same roads." In 1868, John Gamgee was invited by the United States Government to study Texas fever and other animal contagions, but in that task, despite his reputation after the cattle plague epidemic in England, he can only be deemed to have failed dismally. But it must be conceded that, for the first time, he recorded the chief peculiarities of outbreaks, and of their occurrence in districts where the infection was enzootic and gave a fairly detailed report of the symptoms and lesions. But the view held by many that the tick was involved in the communication of the disease he dismissed as " ridiculous."

Then, among the mass of work reported, that of one of America's first veterinary graduates, and one of her most brilliant, Dr. D. E. Salmon (1850–1914), on appointment as first head of the newly created Bureau of Animal Industry in 1883, was outstanding. He definitely located a line, approximating the 37th parallel of latitude, north of which Texas fever was not indigenous and south of which the area was continuously infected. It was, however, another veterinary graduate, F. L. Kilborne (already here mentioned), who, " perhaps alone among scientific men," was wholly committed to the tick theory " and preached it on every occasion." " Smith, in keeping with the scientific beliefs of the time, regarded it as did Gamgee." Smith had then just been appointed chief of the Pathological Division of the B.A.I., Kilborne, his junior colleague, being director of the B.A.I. experiment station; it was Smith who thus reported the investigations which were then planned. Salmon, the head of the B.A.I., had " enough faith in the tick theory to give Kilborne a chance to prove it; but he was sceptical enough about it to send Smith along with Kilborne to check the field work, of which the latter had complete charge. He (Kilborne) planned the first series of experiments (1889), which proved conclusively that the tick was a factor in the transmission of the disease. " It is an indication of the broadness and open-mindedness of Theobald Smith that, against his preconceived notions, he was soon convinced by Kilborne; and became the most enthusiastic promoter of the new theory. It was due, however, to Kilborne's insistence in the tick theory that the investigation was made. . . ." Discussing the matter 45 years later, Kilborne said: " In view of the fact that western stockmen called the disease 'tick fever' and firmly believed the tick was instrumental in spreading it, it is a mystery to me why some of the eastern investigators did not think to plan some tick experiments. To me this seemed the logical thing to do at the outset, to confirm or disprove the tick theory." Though Kilborne previously had ruled out bacteria, believing the cause was probably a protozoan with a complex life history, it was left to Smith to discover the actual piroplasma. It was Cooper Curtice who, largely in collaboration, " established the fundamental facts in the life history of the fever tick and demonstrated that pastures could be freed of ticks by keeping all cattle off them for a period of one year. . . ."

Now, we can turn to the East Coast fever story before proceeding to the climax which afterwards saw the almost complete disappearance of Texas fever from the U.S.A.

Attention was first drawn to this disease, which in its greatly varying degrees of epizooticity and morbidity is now recognised, under the general term theileriasis, as perhaps the most widespread bovine infection on the continents of Asia and Africa as well as in parts of Southern Europe, when in the year 1901 Cecil Rhodes ordered the importation of a cargo of about 1,000 cattle from Australia, landing at the port of Beira, in Portuguese East Africa.

A few months before then, a cargo of cattle had been imported from German East Africa (now Tanganyika Territory) which had also landed at Beira. That territory had been long recognised as an area where the disease (afterwards, in 1903, named by R. Koch as East Coast fever) was enzootic. These cattle grazed together at Umtali and Salisbury. A few died from what was at first believed to be Texas fever, but in three weeks the death-rate had risen to such an extent that the surviving 800 cattle were quickly taken some distance away. Even so, deaths continued to occur till nearly the whole Australian consignment died. Thereafter, the disease was thought to have died out, but during the following two years is spread disastrously to nearly all parts of South Africa. Thanks to energetic measures of control, it was, however, kept pretty well in check, except in Natal and neighbouring districts where it continued to recur with disturbing severity. Koch, who was invited to investigate the calamity, clearly demonstrated the differences between this disease and Texas fever, while in collaboration notably with the entomologist Lounsbury, Theiler worked out the tick transmission, through the successive stages of certain species of " dropping-off " ticks, while it was not carried through the egg stage as in the case of the " continuous " feeder which transmits Texas fever. The many points in connection with the disease itself as well as the vectors that are otherwise of great interest must here be passed over to come quickly to the point regarding the eventual successful control of the disease.

Arsenical solutions, applied as swabs, sprays, or baths, had long been used by farmers, in Australia, South Africa and America to keep down heavy tick infestation on cattle, regardless of any information then forthcoming that ticks were possible vectors of disease. In South Africa researches were soon duly prosecuted to test the efficacy of such solutions to control the new disease by tick eradication. It was natural that, also in America, work was proceeding concurrently to achieve a similar end. The American problem was, however, a much simpler one than the South African; for, whereas it was enough in America to dip the cattle thoroughly about once every three weeks, in South Africa, on the other hand, in view of the shortness of attachment of each of the three tick stages (larval, nymphal, and adult) the interval must not extend beyond five days at the very longest.

Writing upon this possibility in 1904, Theiler and Stockman (*J. Comp. Path. & Ther.* **17.** 193) said: " For practical purposes we consider that we have demonstrated that the

application of dips in a badly infected area gives no guarantee against the further spread of the disease (*i.e.*, East Coast fever), and no hope of extinguishing an outbreak . . . we wish to express the opinion that the plan of erecting a few common dips in a district for the use of all and sundry is calculated to spread the disease, as the pastures around the dips are likely to become infected. . . ." Again, later, in October, 1909 (*Vet. J.* (1910.) **66** (**17**, N.S.). 295), in his inaugural address at the Royal Veterinary College, Dublin, Theiler maintained: ". . . With but a few exceptions the whole country (*i.e.*, South Africa) is infected with piroplasmoses, and attempts to eradicate ticks would be futile. It is therefore advisable to make use of existing *immunity obtained from inoculating for the protection of susceptible animals* (our italics)."

Koch had indeed recommended vaccinating by repeated inoculation with the blood of a recovered animal. But as C. E. Gray, the Chief Veterinary Surgeon, Rhodesia, with much discernment, said (*J. Comp. Path. & Ther.* (1904.) **17.** 203): "It does no harm, it does not communicate the disease, but it fails to protect. . . ." Somehow, after closely studying the reports of Koch's various missions abroad, one cannot fail to gain the impression that whether as a patient field observer or as an immunologist, he was not to be compared with Pasteur or Ehrlich; otherwise, as in his ill-fated bile-method of immunisation against rinderpest, he would not have made such an obviously stupid recommendation. However, probably largely following the lead given by such a high authority, attempts at immunisation, with infected spleen particularly, were pursued in Theiler's own laboratory and elsewhere.

Meanwhile, fortunately, in Natal, field research was being pursued into the possibilities of intensifying a local farming custom to keep down tick infestation by the use of arsenical dips on the Queensland model. These were carried out by the Chief Veterinary Officer, Watkins-Pitchford, who found, contrary to expectations, that cattle could withstand dipping at intervals as short as five days without suffering harm. Even so, on heavily infected pastures, East Coast fever persisted. Then he shortened the interval to three days, and still the cattle suffered no harm. But, now, the disease itself suddenly disappeared.

Writing again in 1914 (*Ztschr. f. Infektskr. d. Haustiere*, 1914, **16**, 1–26) a most comprehensive article discoursing learnedly about dipping in all its aspects, Theiler now concluded: "From the above data it is clear that the use of the arsenical bath is followed by far-reaching results. It solves with one stroke the problem of prevention and eradication of all diseases conveyed by ticks and it remains indispensable in backward parts of the earth for use in livestock development. . . ."

That Theiler's sweeping conclusion, well or even excellently as the arsenical bath may have solved the South African and still easier American problem, does not hold true elsewhere is only too evident to those who have had experience in Asia and Northern and other parts of Africa where the local circumstances remain far *too* backward for systematic dipping to be attempted.

Fortunately, it now emerges that even in those territories the common prevailing menace of bovine theileriasis can probably be overcome, and by vaccination, too; but not in accord with the crude early notions of Koch, Theiler, Meyer and others. Far more needed patiently to be learned about the natural history of the disease than could be acquired in the limited study these men had seen fit to devote to it before hurrying impulsively to publicise their conjectures.

In a large monograph published in 1945, the brilliant French worker Edmond Sergent and his distinguished colleagues, Donatien, Parrot and Lestoquard, of the Pasteur Institute at Algiers, summarised, in happy language, the results of researches carried out without remission by them since 1913 upon the piroplasmoses, which group of diseases afflict cattle throughout Northern Africa and are the chief limiting factor to its agricultural prosperity. One, and one only, but the most serious one, of the group is represented by a theileriasis. "Thanks to vaccination," the authors declare in their frontispiece, "the herds of cattle will prosper (henceforth) in Northern Africa."

It had long been known in the case of the trypanosomes that some races or "species" undergo a cyclical development in certain species of biting flies. That has been well studied, for example, in the case of *T. gambiense*—the common cause of human sleeping sickness—in the fly *Glossina palpalis*; and, in the case of *T. brucei*—the cause of *nagana* in the equidae in tropical Africa—in *Glossina morsitans*. Other races or "species," such as *T. evansi*, the cause of *surra*, undergo no such cyclical development, and are "mechanically" transmitted. But, even in the case of the cyclically developing forms, it has long been known too that in the laboratory, after more or less prolonged passage in small animals, the "species" lose that property and are then indistinguishable morphologically and in other properties from the mechanically transmissible species.

Now, with the commonly prevailing "species" of *Theileria* in Northern Africa, the Algiers workers have succeeded in propagating, by serial rapid transfer in susceptible cattle, over several years, the asexual forms of the parasite as it is found in the blood lymphocytes during the very early, febrile, stage of attack. By selecting a strain of the *Theileria* of low initial pathogenicity, the attack remains mild, showing no increase or decrease in intensity over several years. The recovered animal remains thereafter "premunised" against natural infection, conveyed by the local tick vector. That is, it remains resistant to fresh attack in virtue of harbouring infection in a latent state. But what is of paramount importance is that, having lost at last their capacity for sexual development, the parasites are unable to complete their cycle when taken up by the local ticks if any of the parasites happen to be in the blood when these ticks engorge themselves on the vaccinated animals. Hence, in time, the desired goal is reached when all ticks in a locality in which the cattle have been premunised cease to be vectors of the disease.

Such therefore in brief is the position now reached in regard to a disease of cattle which in the world at large—little suspecting it though we may, from the seclusion of this small island of ours, with its relatively minute cattle population—corresponds in reality in cosmopolitan importance to malaria in the human subject: that position is that, until a short time ago, theileriasis was probably the most prevalent and serious cattle infectious disease in a large part of the world. Now, it augurs well that it need no longer remain so.

Far more important, however, than the undoubted economic importance of this triumph is the moral lesson it provides. It is a fine illustration of the mode of progress by which, in different circumstances, there has been achieved during the past half-century, unknown to the world at large and even to most who are within the veterinary profession itself, an advance in veterinary medicine, that is on a scale at once striking economically and in its scientific character, that is of superb merit. In that advance the native qualities of the competent veterinarian have been displayed to fullest advantage. Those native qualities reside in his powers patiently to resolve a problem within the domain of his art in its peculiar *natural setting*, summoning genially to his aid all that is forthcoming from the resources of existing science. Field and laboratory enterprise thus work in harmony, the latter never obtruding itself upon the former.

(*To be concluded*)

MASTITIS IN AYRSHIRE FROM 1938 TO 1950

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In 1939 almost the whole of the clinical mastitis found in Ayrshire was due to *Str. agalactiae*, the over-all infection rate of which was 33·5 per cent. That is, of the 2,699 cows from representative herds tested *in toto* and examined in that year, 904 were infected with this organism. Compared with this number, the infection rates with *Str. dysgalactiae* (117 cows or 4·3 per cent. of the total) and *Str. uberis* (63 cows or 2·3 per cent.) were very low (Cunningham, Wilson, Ineson, Raymont and Mannan (1947) give respectively 3 per cent. and 2 per cent. for these types of infection). Infection with *Str. uberis* tended to be more permanent than that with *Str. dysgalactiae* (65 per cent. of *uberis* infection proved permanent but only 41 per cent. of *dysgalactiae*). Staphylococcal infection was rarely found, probably because the media used for routine examinations inhibited the growth of these organisms and also because when found by other techniques it was difficult to decide whether or not they were truly pathogenic.

As repeated testing of large numbers of cows by quarter samples has not been carried out for several years it is not possible to compare the earlier figures accurately with the recent ones. During 1950, however, we have resurveyed all the available farms using the same techniques as in the original work. The over-all percentage of infection with *Str. agalactiae* was found to be 11·8, even including one farm with a rate of 64 per cent. (the reason for which I shall refer to later).

There was no evidence of any increase in the infection rates of other types of mastitis.

There has thus been a reduction in the amount of mastitis by approximately two-thirds. To what has this been due? There have been two factors affecting the incidence of mastitis. Firstly, an improvement in many farms of milking practices, partly due to propaganda and partly to increased financial stability, and, secondly, the use of sulphanilamide and penicillin in the treatment of obvious clinical cases.

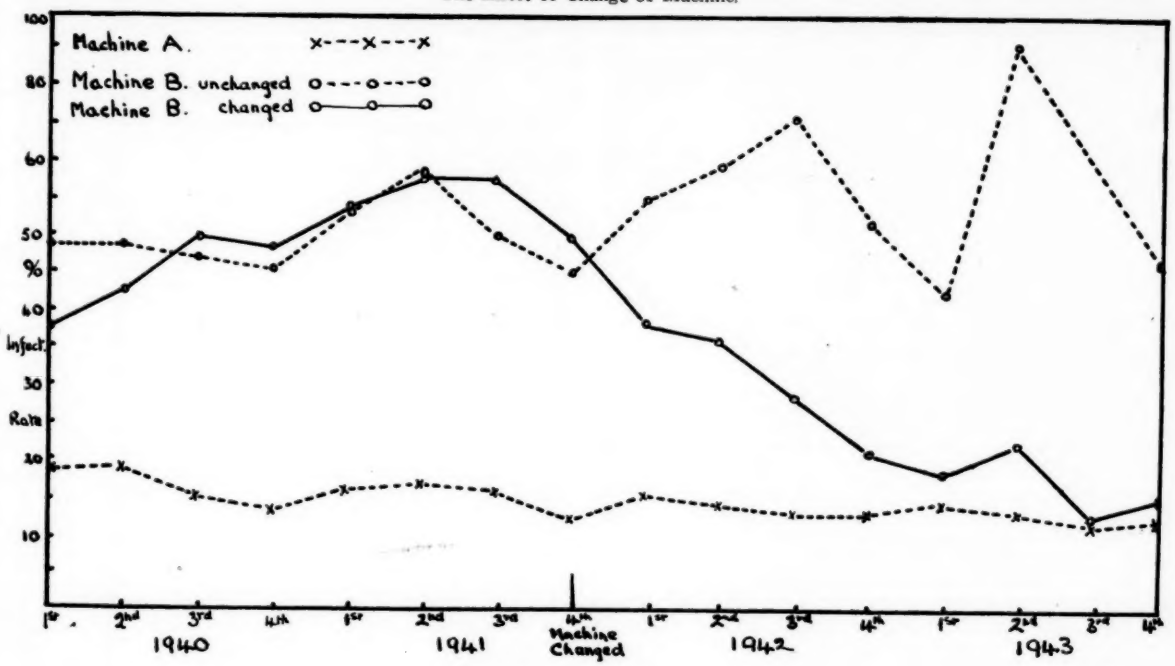
In the early part of the period under review a number of farms were using a particular machine with a number of special features. The liner was a heavy moulded type usually worked at about 18 inches of vacuum and a high pulsation rate of over 100 per minute. The herds so milked showed high mastitis incidence rates (average 45 per cent.) and have nearly all changed their machine. The herd mentioned above with a present incidence of 64 per cent. is the only one remaining. Chart 1 shows what we found occurred when nothing else was varied but the machine was changed. It shows clearly that with the change of machine from one type to the other, the mastitis incidence rate dropped to the average recorded for all the herds using the second machine. The time intervals on this chart have been arranged in quarters of the year as there is a slight seasonal change in the incidence rates. This change is better shown in Chart 2, where the figures for 27 farms with similar management have been analysed by season. It will be seen that the greatest incidence is recorded in the autumn of the year. This does not agree with Ward and Castle (1945) in New Zealand, but does with Arthur (1947) and with Ineson and Cunningham (1949) from the East of Scotland, who suggest that this is due to climatic factors. Their figures are carefully analysed to exclude other factors, but in our own case I consider that the explanation of the higher incidence in the autumn is at least partly due to the physiological condition of the cows, *i.e.*, to their stage of lactation.

The figures for 369 animals which were known by repeated tests to be free of mastitis and which then became infected were analysed. Their lactation periods were divided into three and the number becoming infected in each third was recorded: 157 first showed infection during the first three months of lactation, 82 during the second three months and 130 during the last. That is, more became infected at the beginning and end of lactation than during the time of full lactation (see Arthur (1947) and Ineson and Cunningham (1949)). In the farms studied the heifers are calved in the autumn and the cows in the spring. The figures for calvings for two years at 30 farms give the curves shown in Chart 3 with two peaks, one in October and one in March. The maximum amount of mastitis will occur at the time when the largest number of animals are in the most susceptible stages of lactation, *i.e.*, are either just calved or going dry. If Mahadevan's (1950) figure of 80 days as the average dry period for cows in this area is applied, the time at which the maximum number of cows are dry will be between December and February. It is from August to November—a period which also contains many newly calved heifers and a proportion of cows which missed calving in the spring—that the maximum number of animals will be at the end of their lactation periods. This period represents therefore the period of greatest susceptibility in mature cows and in recently calved heifers, while the three months of December, January and February is the time that the majority of infected cows (*i.e.*, old cows) are dry. One would therefore expect a low incidence of mastitis in the first quarter of the year, rising to a maximum toward the end of the year. This is the observed " seasonal " curve which can thus be, at any rate, partly explained by the effect of the stage of lactation on the susceptibility of the cows.

Other than this stage of lactation, the effect of the method of milking was the only factor we could assess that definitely affected the incidence rate. It has been suggested that pressure on a full udder predisposed to infection (*e.g.*, Nottbohn. 1928) and that hind quarters are more affected than fore, though Bryan and Taylor (1938) did not agree. We also could not confirm this. The records of 3,580 cows are given in Table I and show that during 12 months the total number of quarters affected was similar, whether they were on the left or right, fore or hind, though occasionally in individual herds, *e.g.*, No. 9, one quarter was more often affected than the other three. Similar results were recorded in the next 12 monthly period. Since these figures relate to every quarter found infected even if only once, they could be due to one or more quarters of a cow being permanently infected, while the others were merely temporarily infected from this quarter without themselves being seriously invaded. The records were therefore studied to ascertain the numbers of quarters in previously free cows which became infected and which quarter, if any, was most commonly recorded as being the first to be infected. The figures, which are

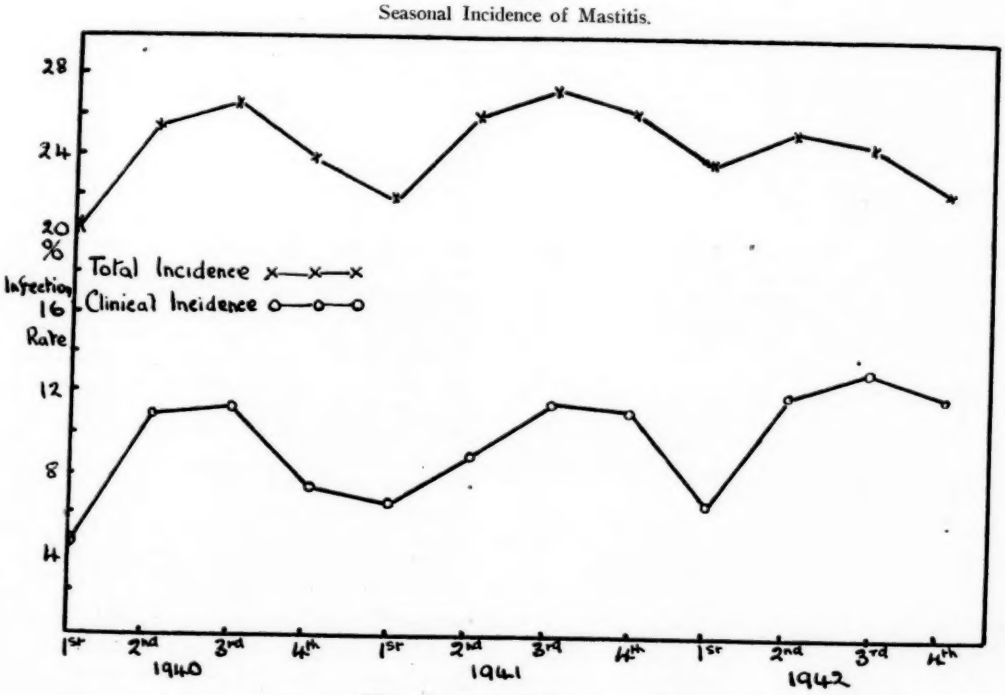
* Paper read to the Ayrshire Division, N.V.M.A., on July 6th, 1950.

CHART I
The Effect of Change of Machine.



Time—in quarters of a year.

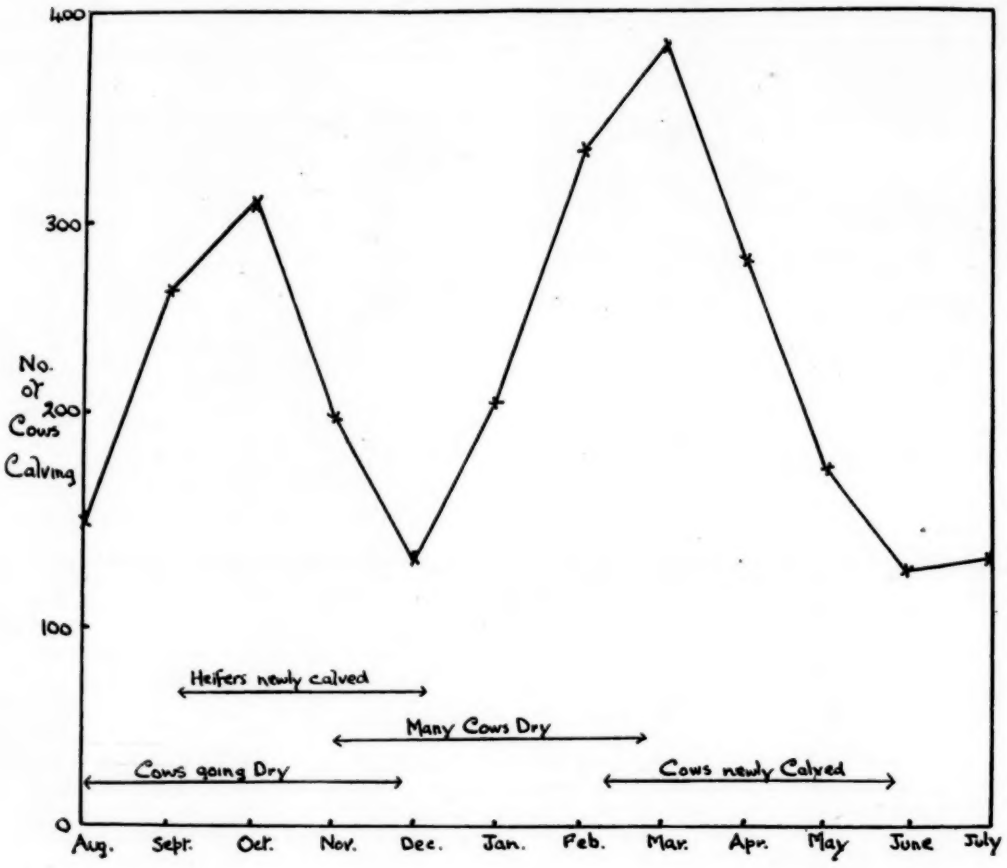
CHART II
Seasonal Incidence of Mastitis.



Time—in quarters of a year.

CHART III

Calving Chart.



given in the same table, show conclusively that no one quarter is more prone to infection than any other. The slight difference between the right and left hind quarters in the number of quarters which become infected before the others is probably due to sampling error. It is not significant.

Another suggestion frequently heard is that high yielding cows are more susceptible than low. To study this five representative farms were chosen in which 127 cows had had two or more lactations during which full details of milk yield and mastitis infection had been recorded. They were divided into two, one group of 77 which had had no history of mastitis and one of 50 which had had at least one normal lactation followed by infection at the second or subsequent lactation. The average milk yield of the 77 animals which did not become infected was 770 gallons, while that of the cows that did become infected was 788 for the normal lactation preceding infection. These figures are so close that the slight difference of 18 gallons in 788 is of no practical significance and there is therefore no evidence that the yield affects the susceptibility to mastitis. This view, however, is widely held and one explanation may be that the lower yielding animals are sold earlier than the higher yielding ones. Thus a cow giving a high yield is kept exposed to infection during several lactations. They thus tend to be the older animals in the herd and are more likely to be infected. This greater incidence of mastitis in older cows has not been studied in this work as it is well known (see Murphy (1947)).

Connected with milk yields, since it is reputed to increase this and to be particularly useful in high yielding cows, is the practice of stripping cows by hand after machine milking. Enquiries among the 50 farms revealed only one that carried out this practice regularly on all the animals and it was therefore not possible to establish any connection between this and the mastitis infection rate.

If the results of all the herds tested during the years 1940 to 1944 are grouped according to their milking practices the graph shown in Chart 4 is obtained.

TABLE I

INFECTION OF INDIVIDUAL QUARTERS

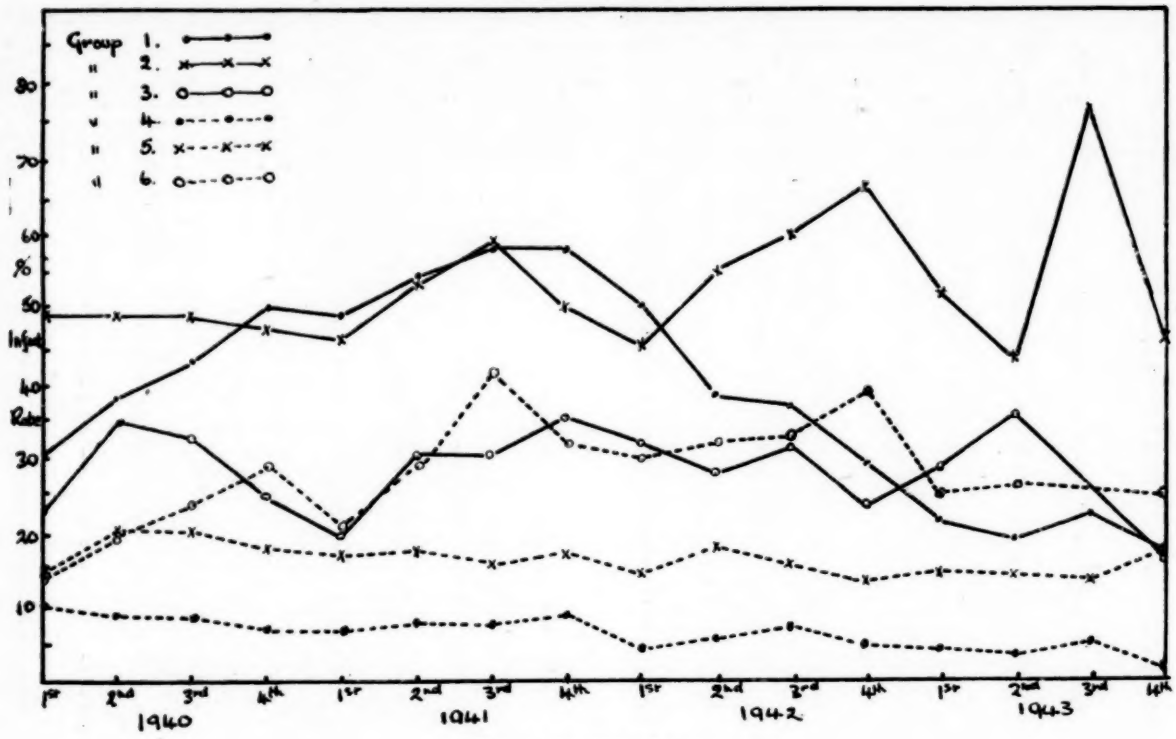
Herd	Total								Number of cows previously clear which became infected during the 24 months	Permanent infection in each quarter in previously free cows (over 24 months)				Numbers of each quarter which were the first to show infection			
	First 12 months				Second 12 months												
	LF	LH	RF	RH	LF	LH	RF	RH		LF	LH	RF	RH	LF	LH	RF	RH
1	11	10	8	9	2	2	6	5	11	2	4	4	4	3	5	4	5
2	11	11	17	13	17	13	16	13	17	3	7	6	5	4	7	7	4
3	10	9	10	10	2	4	4	3	3	1	1	2	0	1	1	1	0
4	15	22	28	22	16	20	25	23	11	1	5	6	4	3	5	5	5
5	10	12	8	11	2	5	4	6	7	2	3	3	2	2	2	3	2
6	14	19	13	17	21	18	9	17	16	7	3	2	8	6	5	0	7
7	1	2	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	12	17	12	15	9	12	9	10	5	1	2	4	4	1	1	2	4
9	5	2	10	2	1	3	2	0	2	1	0	1	0	1	0	1	0
10	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
11	4	7	7	6	4	3	2	8	2	0	2	0	1	1	1	0	1
12	0	0	2	2	4	4	2	4	4	0	2	2	3	0	2	2	3
13	5	6	9	6	1	2	3	1	2	1	1	1	0	1	1	1	0
14	5	4	4	4	4	5	2	2	4	1	3	1	1	1	3	1	1
15	3	5	7	1	2	4	2	6	8	2	2	2	4	1	3	1	4
16	7	8	10	7	8	5	6	11	7	3	3	3	5	1	1	4	4
17	17	20	19	23	13	13	11	18	9	2	5	4	5	3	5	4	4
18	2	6	3	4	3	3	5	5	5	1	1	2	3	0	1	1	3
19	2	1	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0
20	4	6	2	7	0	2	1	3	6	0	4	1	2	1	4	1	2
21	5	8	6	5	3	5	2	6	4	2	2	1	1	2	2	1	1
22	8	3	7	7	0	2	2	1	3	1	2	0	0	1	2	1	0
23	3	2	4	4	2	2	2	1	2	1	0	1	0	1	1	1	0
24	8	5	3	8	2	2	3	2	2	0	1	1	0	1	1	1	0
25	4	4	3	2	6	4	5	7	2	1	0	1	0	0	1	1	0
26	9	14	3	15	5	6	4	10	10	2	4	3	2	1	5	3	2
27	6	6	2	5	7	8	4	6	4	1	3	1	1	1	3	1	0
28	12	20	15	17	12	10	13	13	7	2	4	4	2	1	4	2	2
29	12	17	17	14	10	15	19	17	8	4	2	4	3	5	2	5	2
30	7	3	3	5	3	4	2	3	4	1	1	1	1	1	1	1	1
31	7	7	8	5	4	5	4	5	8	3	3	4	4	4	5	4	2
32	10	16	8	7	19	14	22	15	13	8	8	7	7	5	6	3	5
33	17	15	19	15	22	21	25	21	9	3	1	7	1	5	2	6	3
34	16	9	12	10	4	3	7	5	1	0	1	0	0	0	1	0	0
35	12	16	15	12	14	17	18	16	9	1	5	4	5	4	4	2	4
36	24	21	26	23	19	14	22	15	19	8	8	9	10	4	4	7	8
37	13	10	13	10	24	18	20	16	18	11	8	9	7	9	6	5	3
38	67	64	65	66	70	70	70	61	30	19	14	14	11	18	11	13	10
39	16	22	21	17	15	16	16	19	7	1	4	2	4	1	3	2	4
40	42	39	37	40	49	40	42	36	28	16	12	10	16	13	10	6	11
41	27	26	27	31	33	39	35	32	10	6	8	4	5	3	5	4	2
42	26	18	22	14	30	21	28	22	10	6	2	9	4	5	3	6	2
43	10	7	16	11	28	27	25	22	22	12	11	12	7	6	7	13	5
44	7	8	6	9	11	11	11	14	7	5	4	5	3	4	5	2	1
45	5	6	4	6	1	7	3	7	6	1	4	1	3	1	3	1	2
46	19	20	16	16	18	14	12	16	21	7	7	7	10	10	7	8	7
47	9	10	11	12	27	20	31	26	16	11	7	12	11	4	3	5	7
48	21	16	21	18	12	13	10	14	11	5	4	5	4	5	4	4	3
49	1	0	4	1	1	0	2	3	2	0	0	1	1	0	0	1	1
50	11	9	9	9	12	12	9	14	6	2	3	0	1	2	4	1	0
51	5	1	4	4	6	3	8	8	5	1	0	4	5	1	0	4	4
52	10	13	7	11	4	3	0	2	8	5	3	0	3	3	4	2	3
53	4	4	9	5	10	7	2	4	3	1	0	1	1	1	0	1	1
54	1	1	2	6	2	2	1	0	0	0	0	0	0	0	0	0	0
Total	593	608	623	603	584	573	588	594	435	174	184	188	184	155	166	155	145

Groups 1 and 2 consist of herds milked by an unsatisfactory method up till the end of 1941. The herds in Group 1 then changed their method, while Group 2 did not. The difference in mastitis incidence rate by the end of 1943 is clearly shown, the average mastitis infection rate in Group 1 having fallen from over 50 per cent. in 1941, at the end of which the machine was changed, to 15 per cent. two years later, while the infection rate in Group 2 (the unchanged group) remained high. The results are actually better than is apparent since this reduction in the mastitis rate was accompanied by a rise in the average age, inasmuch as cows had no longer to be disposed of so early, *i.e.*, the incidence rate before the change was kept down to 50 per cent. only by the sale of the older animals and was therefore lower than it would have been if the animals were kept as long as they were during 1942 and 1943 (after the machine was changed).

Group 3 consists mainly of herds milked by a reason-

CHART IV

Average Infection Rates.



Time—in quarters of a year.

ably, but not entirely, satisfactory type of machine, together with herds in which various other factors—*e.g.*, dairying as a sideline to early potato farming instead of being the main interest—militate against satisfactory results in mastitis control. The infection rate in this group, though not so high as in Group 2, has been consistently around 25 to 30 per cent.

Groups 4 and 5 consist of herds with good milking conditions. Group 4 comprises those herds which, in addition to being suitably milked, consistently carried out segregation, usually by the sale of infected stock as soon as it was economically possible. Even in these herds, infected animals have been retained for fairly long periods, but in most every endeavour has been made to reduce the mastitis rate. This rate in 1940 was 10 per cent., slightly less than in Group 5 herds, possibly due to the owners being more careful about the disease even before testing was started. The infection rate has been reduced to 1·5 per cent. with six out of the nine herds having infection rates of 0 per cent. In three herds there has been no contagious mastitis for many years now. Group 5, the largest of all, contains herds milked as in Group 4, but in which there has been little effort made to eliminate mastitis. The herds have been tested repeatedly, but although in some cases there has been " segregation " by washing and milking affected cows last, there has been no segregation in the strict sense of the word and no sale of infected animals, except such as would normally occur when these became so severely affected as to be useless or when they suffered from some other disease. It was found that the greatest obstacle to the disposal of cows infected with " latent " mastitis was that the herds being self-contained and consisting of tuberculosis-free, pedigree, milk recorded animals, the animals had a greatly enhanced value, especially as dams of bull calves. As in this group of herds the amount of clinical mastitis was very low and the value of the animals both from the breeding and monetary points of view was greater than the apparent loss due to mastitis, there was no incentive to the farmer to dispose of them. They thus formed a residuum of infection, but it was remarkable how little the disease spread, since four or five such animals in a herd of 30 gives an infection rate of about 15 per cent. and this often constituted the whole infection in a herd at any one test. In early 1940 the infection rate in this group of herds was between 15 to 20 per cent. and it has remained remarkably constant around this figure for the whole four-year period.

Group 6 comprises the four hand-milked herds, and although two of these are of the " Home Farm " type where every facility is available, the mastitis rate has remained high at about 25 per cent. The reason is possibly the greater extent to which the cows are handled, with the difficulty of sterilising the hands, or it may be that the standard of labour is not sufficiently high to prevent injury to the teats by forcible traction, untrimmed nails, etc. It is interesting in this connection to note that Peterson (1944) has demonstrated that hand-milking exerts more pressure than a properly adjusted machine and that this pressure is particularly severe on the delicate accessory glands at the base of the teat.

These groups are related to the method of milking and comprise herds with considerable variations in other factors. These factors have not been assessable, but it has been possible to obtain figures showing the relationship between the mastitis infection rate and the loss in milk. This has already been assessed on an individual cow basis by White, Anderson, Jonnson, Plastridge and Weirther (1937), who recorded an average loss of about 6 per cent. in two herds they investigated. In the present work the assessment has been made on a herd test basis to see if the degree of infection with mastitis is correlated with the age of the cows in the herd, the average yield of the cows in the herd, or the proportion of the herd in milk at any one time.

This last figure should show if mastitis increases the length of the dry period by causing premature drying off.

Not only was it considered that figures based on herd averages would be more accurate than those relating to the individual records, but it was also necessary to have figures of herd yields in order that the various groups could be compared. It was obviously essential to ascertain if the method of milking " high incidence " herds was in fact so efficient that an increased yield was obtained more than compensating for the loss due to mastitis. Similarly it was necessary to know if the herds in Group 4 (Chart 4) had only decreased their percentage of infection by disposing of their older and possibly better yielding cows and thus lost more than they had gained. In the majority of the herds figures were obtainable from the official milk record books, but in some, owing to sale of farms, loss of books or other causes, they could not be ascertained.

In all, the individual records of 5,876 cows were analysed. The first point of interest was that in Groups 1 and 2 where the method of milking was considered unsatisfactory, only five out of the 12 herds (42 per cent.) were milk recorded. It was therefore apparent that there was no possibility of obtaining a complete record of the yield in this group, but it was significant that the majority of herd owners did not consider that their cows were yielding sufficient milk to be recorded. That the alternative possibility of the herds belonging to small unprogressive farmers was not correct was shown by the fact that three of the seven were among the largest tested and that since changing the machine they have all become recorded.

All the available records in this group, however, were obtained together with those for the other groups. The amount of milk yielded by each cow at each test was recorded and the total yield of all the cows at that test obtained by addition. The result was divided by the number of cows in milk and gave the average yield per cow. The average yields at each test were then added and divided by the number of tests. This figure was considered the average yield of the average cow per day. These figures being constant for all the groups could be compared.

In addition, the ages were recorded and averaged for each year and the average percentage of cows in milk was also calculated. The final figures are shown in Table II.

Groups 1 and 2, where the mastitis rate was highest, showed a consistently lower average age and average milk yield. The high rate of disease in these groups was therefore not due to the retention of old cows or to any increased susceptibility of high yielding cows. The fairly high rate recorded for the group of hand-milked herds (Group 6) could, however, have been due to these factors since this group had the highest average age, the highest yield and the shortest dry period. The herds in Groups 4 and 5, where the mastitis incidence rate was lowest, showed no evidence that this low rate was due to early disposal of stock (average age, 5·2 against 4·9 and 5 for the other groups) or to a low milk yield (27·3 lb. per day against 25·2 and 24·4 for the other machine-milked groups). Neither was there an excessive dry period in this group. The total figures showed therefore that the method of milking in Groups 4 and 5 was not only satisfactory, so far as mastitis was concerned, but that it did not adversely affect the age of the cow or the amount of milk yielded, which, in fact, was greater than in either of the other two groups of machine-milked herds.

The difference in milk yield between the heavily infected and lightly infected groups was 2 lb. of milk per cow per day, which represents a loss of 7·9 per cent. (7 gallons in 89 gallons).

This is in close agreement with the 6 per cent. loss recorded by White *et al.* (*loc. cit.*) working on an individual cow basis and was further checked by a similar individual cow analysis of the yields in five representative farms. On these five farms 50 cows had at least one lactation free from mastitis followed by at least one during which mastitis was recorded as constantly present for a considerable part of the lactation. Cases where infection was recorded only at the end of the lactation were omitted. These 50

Table II

Age, Average Yield and Percentage of Cows in Milk

Group	1940			1941			1942			1943			Means of averages for four years		
	Age	Yield (lb.)	Percentage in milk	Age	Yield (lb.)	Percentage in milk	Age	Yield (lb.)	Percentage in milk	Age	Yield (lb.)	Percentage in milk	Age	Yield (lb.)	Percentage in milk
1 and 2	4·7	26·5	65	5·0	25·0	67	5·1	24·1	64	4·9	25·3	70	4·9	25·2	66·5
4 and 5	5·4	29·1	68	5·0	26·3	67	5·1	26·2	65	5·4	27·6	68	5·2	27·3	67
Part of 3	4·8	25·0	68	5·0	24·0	69	5·1	23·7	67	5·2	25·0	68	5·0	24·4	68
6	5·3	30·3	69	5·8	28·9	71	5·5	27·4	71	5·7	25·9	69	5·6	28·1	70
Mean of 5,876 cows	5·2	27·7	67	5·0	26·0	68	5·2	25·3	67	5·3	25·9	69	5·2	26·2	68

cows had an average yield of 788 gallons for non-infected lactations and of 724 gallons for infected lactations. This represents an over-all loss of 8·1 per cent., a figure extremely close to the 7·9 per cent. for the herds as a whole. These figures are rather lower than those of Minett and Miller (1936), who recorded a loss of 10·8 per cent. in one herd of Ayrshire cattle.

Since 1944 it has not been possible to obtain comparable figures as treatment affected the results considerably. Wide employment of sulphanilamide and penicillin just before a test often gave a clear test, whereas a test a few weeks later gave different results. We have, however, recently surveyed 15 farms of similar type in which the average mastitis infection rate was 14·1 per cent. in 1944. It is now 10 per cent. A further five farms had an infection rate of 24 per cent. in 1944. These five were treated intensively with penicillin during 1948-1949 and when recently retested had an average infection rate of 6·4 per cent. Less intensive treatment has consisted of either treating every cow we have found infected on herd tests or merely treating clinical cases as they occurred. So far, there seems to be little difference between the results obtained by either method. Treatment is now, of course, universally by intramammary injections of penicillin in oil and the vast majority of cases have been treated with 25,000 unit tubes, though recently the 100,000 unit dose has increased very considerably in popularity. There is some evidence that a higher dosage than 25,000 units is useful in the more acute cases, but certainly for non-clinical infections there is steadily accumulating evidence that 25,000 units on three successive days is as successful as any greater dose in eliminating the infection. In this connection it should be borne in mind that it is extremely likely that a cured cow is more susceptible than one not previously infected. This question of lack of resistance to further infection leads to another point I might mention. This is the question of vaccination. It has been a controversial subject for many years (see Plastridge, Anderson, White and Rettger (1934), Munch-Peterson (1938), Clark, Bryan and Horswood (1942), Kearney and Maloney (1943)), but just before penicillin became available it was rather popular in this district. The vaccine used was a formalised autogenous whole culture prepared by Professor Emslie, of the Glasgow Veterinary College. He in no way claimed any preventive value for it, but it was used quite extensively. He very kindly prepared some for us and we vaccinated two herds in the autumn of one year and the spring and autumn of the following year. The average infection rate in the two herds combined during this period was:—

1st Year	1st quarter	...	21·5 per cent.
	2nd quarter	...	36·0 per cent.
	3rd quarter	...	42·5 per cent.
	4th quarter	...	52·0 per cent.
2nd Year	1st quarter	...	56·0 per cent.
	2nd quarter	...	42·0 per cent.
	3rd quarter	...	36·0 per cent.
	4th quarter	...	38·0 per cent.

There was thus no evidence of any improvement due to vaccination. The owners, however, were convinced that there was less clinical mastitis than before vaccination and a further herd was therefore chosen, where very close and accurate observations could be kept on the cows at every milking. All clots in the milk were noted and sulphanilamide was administered immediately.

The 60 animals in the herd were divided into two groups of 30 each. One group was vaccinated with an autogenous formalised whole culture, while the other group was kept as control. The full daily clinical results are given in Table III and show clearly that vaccination had no effect on the extent of the clinical infection in this herd or on the time taken by sulphanilamide to effect a clinical "cure."

An autogenous vaccine prepared as above and used at the doses specified had therefore no effect on the mastitis infection rate, the clinical infection rate or the rapidity of "cure" under chemotherapy.

As mentioned at the beginning of this paper, types of mastitis other than that due to *Str. agalactiae* have been comparatively rare. *Str. dysgalactiae* and *Str. uberis* have never become of economic importance, but staphylococcal mastitis occasionally has. Certain farms were affected considerably in the early 1940s, but in the pressure of war work little controlled experimental work could be carried out. In three such farms autogenous formalised whole culture vaccines were prepared and administered to the whole herd. Complete success seemed to follow their use, but as repeated yearly injections tended to give fairly severe reactions, causing some loss of milk yield, particulary in heavy milkers, they were used only when essential. These farms have not been affected since, so that it is possible they would have cleared without the use of vaccine.

Following heavy dosing with penicillin, certain farms showed a high incidence of staphylococcal mastitis, though this was not usually acute. It was hoped to carry out controlled experiments on vaccines in these cases, but unfortunately they cleared themselves to such an extent that no satisfactory experiments could be devised.

A certain amount of mastitis due to *Corynebacterium pyogenes*, though relatively little, has also occurred. However, a number of acute cases of mastitis considered by the practitioners treating them to be typical of gangrenous staphylococcal mastitis have proved to be actually corynebacterial. In one case at least the practitioner was convinced by microscopical examination that it was definitely staphylococcal. Care should be taken therefore before such cases are treated as staphylococcal in origin. Despite the considerable amount of work we have done on this disease, we have not been able to progress any farther or even to determine whether toxoid is of any value either as a preventative or as a therapeutic agent. Successive years have given different results.*

We can therefore summarise these last 12 years so far as mastitis in Ayrshire is concerned, by saying that there is little change in the amount of mastitis due to bacteria other than *Str. agalactiae*, but that this latter type has decreased from approximately 33 per cent. to 12 per cent. Part of this decrease has been due to the wide employment of sulphanilamide and penicillin and part to improved milking technique.

Acknowledgments.—The work described above was made possible only by the complete co-operation of the local veterinary practitioners and by the financial assistance of the Agricultural Research Council.

* Weitz concluded from his work in Anglesey four years ago that the use of toxoid or vaccine in summer mastitis is of no value as a prophylactic.—*Editor.*

TABLE III

THE EFFECT OF VACCINATION ON THE CLINICAL INFECTION RATE

Week		Number of quarters recorded as clinically affected each day							Total for week
		Sun.	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	
1	Vaccinated	0	0	0	1	1	1	1	4
	Unvaccinated	5	5	5	1	0	2	2	20
2	Vaccinated	0	3	3	1	2	2	1	12
	Unvaccinated	1	1	0	2	3	2	2	11
3	Vaccinated	1	1	1	0	0	0	4	7
	Unvaccinated	0	2	1	0	0	0	1	4
4	Vaccinated	4	3	0	0	0	0	0	7
	Unvaccinated	1	2	1	0	0	0	0	4
5	Vaccinated	0	2	2	0	0	0	0	4
	Unvaccinated	1	2	3	2	2	0	1	11
6	Vaccinated	2	2	1	1	2	1	1	10
	Unvaccinated	0	0	0	0	0	1	1	2
7	Vaccinated	1	3	3	2	1	1	2	13
	Unvaccinated	0	0	0	0	0	0	1	1
8	Vaccinated	2	1	0	1	1	1	1	7
	Unvaccinated	2	2	1	0	0	1	1	7
9	Vaccinated	1	2	2	2	2	1	1	11
	Unvaccinated	0	0	1	1	0	2	2	6
10	Vaccinated	1	0	0	0	0	0	1	2
	Unvaccinated	1	0	0	0	0	0	0	1
11	Vaccinated	1	1	0	0	1	1	3	7
	Unvaccinated	0	0	1	1	1	2	2	7
12	Vaccinated	3	1	0	0	0	0	0	4
	Unvaccinated	0	0	0	0	0	0	0	0
13	Vaccinated	0	0	0	0	0	0	0	0
	Unvaccinated	0	0	0	0	0	1	1	2
14	Vaccinated	1	1	1	1	1	0	0	5
	Unvaccinated	1	1	1	1	1	0	1	6
15	Vaccinated	0	0	0	1	1	1	1	4
	Unvaccinated	1	1	1	1	0	2	2	8
16	Vaccinated	2	1	1	1	1	1	1	8
	Unvaccinated	2	1	1	1	1	1	1	8
Total	Vaccinated								105
	Unvaccinated								100

Total number of cows showing clinical signs.	Vaccinated	13
	Unvaccinated	9
Total number of separate " attacks " of clinical mastitis.	Vaccinated	33
	Unvaccinated	34
Average time in days for sulphanilamide to " cure " clinical signs.	Vaccinated	2·5
	Unvaccinated	2·5

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CLINICAL COMMUNICATION

THE OCCURRENCE OF KETOSIS IN PREGNANT EWES, ASSOCIATED WITH PARASITISM

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This communication records the occurrence of ketosis in pregnant ewes suffering from a parasitic infestation.

History.—The flock of 60 ewes was maintained at pasture and during pregnancy received supplementary feeding of oats and tail barley (1 lb. per head) and chaff. Twenty ewes lambed normally in early February, but subsequently these ewes and their lambs rapidly lost condition. There was no trouble in the remainder of the flock until March, when deaths occurred in heavily pregnant and recently lambed ewes after an illness of four to five days. A *post-mortem* examination performed on a dead ewe gave no conclusive findings and as deaths were still occurring a visit was made to the farm.

Examination.—On examination, many ewes, both pregnant and post-parturient, were found to be in extremely poor condition. Some showed a nasal discharge and many were coughing. A few were scouring but not excessively. It seemed probable that the flock was suffering from parasitic infestation. Some heavily in-lamb ewes in poor condition had a sweet smelling breath, reminiscent of acetonaemia in cattle, and questioning elicited the information that these animals had poor appetites and that in some a staggering gait had been observed. Three acutely sick animals were seen, two in a comatose condition. The symptoms did not resemble those of pregnancy toxaemia as described by Parry (1950).

The two moribund ewes died within a few hours of our visit and were subjected to a detailed *post-mortem* examination. The main lesion observed was fatty infiltration of the liver, although histological examination showed that the degree of infiltration was less marked than that usually seen in pregnancy toxaemia. It must be admitted, however, that fatty infiltration may be a normal accompaniment of pregnancy (Dryerre and Robertson, 1941). There was no ischaemia of the adrenals and no abnormalities were detected histologically. Both animals were heavily parasitised. Accurate counts were not performed, but adults of *Dictyocaulus viviparous* and *Muellerius capillaris* and larvae of *Protostrongylus rufescens* were found in the lungs. The fourth stomachs of both sheep contained more than 10,000 Ostertagia spp. and the intestines of one, in addition to Ostertagia spp., contained considerable numbers of other nematodes.

Samples of jugular blood were collected from a number of ewes which were still feeding and estimations for ketone bodies were carried out using a modification of the method of Greenberg and Lester (1944). The following table records the results:—

Ketone Bodies expressed as Mg. Acetone per cent. Jugular Blood

			Mean
Group A. Ewes in good condition before lambing.	1.	2·0	1·8
	2.	1·8	
	3.	1·6	
	4.	1·5	
	5.	2·2	
Group B. Ewes in poor condition before lambing.	1.	11·6	14·3
	2.	11·9	
	3.	13·4	
	4.	14·2	
	5.	16·5	
	6.	18·0	
Group C. Ewes in poor condition after lambing.	1.	1·1	1·7
	2.	1·6	
	3.	1·8	
	4.	2·3	

After a 48-hour fast, values for one ewe from Group C rose from 2·3 to 3·4 mg. per cent. It has not been possible to find out what percentage of Groups A and B carried twin lambs, although the ewe in Group B showing the highest value (18·0 mg. per cent.) carried more than one lamb.

In view of the parasitic infestation all ewes were dosed with phenothiazine soon after lambing. Phenothiazine was not given to the heavily pregnant ewes. In order to increase the caloric intake, the more extreme cases were given glucose subcutaneously and a meal containing molasses was added to the diet of all ewes. The owner declared that an improvement was noted soon after the introduction of the molasses meal. He also noted that ewes showed an immediate improvement on lambing and further improvement after anthelmintic treatment. The average lamb crop for the flock was 1·5 lambs and five ewes gave birth to triplets.

Discussion.—In the cases reported here, the average value for ketone bodies of the ewes in good condition before lambing was 1·8 mg. per cent., which is in agreement with a mean level of 2·04 mg. per cent. found in normal heavily pregnant ewes by Sampson (1947). The average value for those ewes showing clinical signs of advanced parasitism was 14·3 mg. per cent., a definite ketonaemia, although well below the values for experimental ketosis (25 mg. per cent.) and for pregnancy toxaemia (41 mg. per cent.) recorded by Sampson (1947).

It has been shown by many workers that starvation of the pregnant ewe, especially when in good condition, results in ketonaemia and hypoglycaemia resembling spontaneous pregnancy toxaemia (Hopkirk, 1934; Fraser *et al.*, 1939; Groenwald *et al.*, 1941; Underwood & Robinson, 1942; Forbes, 1943). Fraser *et al.* (1939) showed, furthermore, that pregnant ewes, kept on an inadequate ration, became hypoglycaemic and ketonaemic, although not necessarily with symptoms of ill-health, and that the condition was exacerbated by multiple pregnancy. Hammond (1944) has advanced the hypothesis that when available nutrients are limited during pregnancy, foetal tissues, because of their higher metabolic rate, compete successfully with the maternal tissues. The fact that starvation ketosis can be produced readily only during the last few weeks of pregnancy may, in part, be explained by this hypothesis and by the work of Barcroft (1945), who showed that it is not until about the 130th day that the foetal

growth rate increases rapidly and by implication the foetal demands become significant in relation to the normal maintenance demands of the ewe. Wallace (1948) has pointed out that the effects of malnutrition, whether of a quantitative or qualitative nature, during the last weeks of pregnancy might be expected to be more severe in ewes that had been well fed previously because of the resultant greater weight of the foetus. In this flock, ewes were on a good plane of nutrition, a fact that would exacerbate the effects of a later occurring relative starvation, and it is of some interest to note that after parturition when the foetal metabolic demands had been removed, the ketone values fell to 1·7 mg. per cent. Hitchcock and Phillipson (1946) have reported a similar return to normal of the glucose values following parturition in a pregnant ewe, with liver fluke infestation, which had shown symptoms resembling pregnancy toxaemia.

The data presented in this communication are insufficient to justify any definite conclusions regarding the relationship of parasitism to ketosis in the pregnant ewe. The increased metabolic demands at the end of pregnancy, as evidenced, for example, by the raised basal metabolic rate (Ritzman and Benedict, 1931) and the estimate that 17 per cent. of the total calories can be referred to twin lambs (Phillipson, 1950), suggest that the additional burden of a heavy parasitic infestation might provide a state of relative malnutrition sufficient to induce the development of a ketonaemic state.

Summary

1. Deaths in a flock of ewes at lambing time associated with a heavy parasitic infestation were investigated.

2. Analysis of blood samples for ketone bodies (expressed as mg. of acetone per cent.) showed a mean value of 1·8 mg. per cent. (1·5 to 2·2 mg. per cent.) for pregnant ewes in good condition, 14·3 mg. per cent. (11·6 to 18 mg. per cent.) for pregnant ewes in poor condition and 1·7 mg. per cent. (1·1 to 2·3 mg. per cent.) for ewes in poor condition after lambing.

3. The possible relationship between parasitism and ketonaemia is discussed briefly.

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THE VETERINARY RECORD

January 20, 1951

MOTOR CARS : A CALAMITOUS POSITION

WE have come to regard controls as part of the general scheme of things. However irksome, however irrational many of these controls may be, most of us realise that in a world of shortage of money and raw materials, controls of some sort must continue.

But the fewer the better!

One control, however, which may well be re-introduced is that on the sale of new motor-cars.

In this respect the profession has been treated badly and we can derive little satisfaction from the recent press notice issued by the Society of Motor Manufacturers and Traders on the supply of new cars. (*Vet. Rec.* **62.** 767.) In theory, veterinary surgeons are placed favourably in relation to all other users, except doctors and midwives. In reality, this has not been the case in the past, and there seems little hope that it will be in the future.

The task of actually deciding who shall, or who shall not, receive a new car rests with the individual distributor. The onus of making a decision has been passed from the Government to the S.M.M.T. and from the S.M.M.T. to the private trader. What a woeful display of bureaucratic ineptitude! Such a method is not fair to the private trader, it is not fair to his customers, and it may give rise to all sorts of inequalities, not only in different parts of the country but in a single area.

Veterinary surgeons have a very special case for generous treatment. Their work is of first importance in a land battling with food shortages and increasing hard currency shortages. It is hard to conceive of any other profession whose cars have to stand up to such arduous work. The high yearly mileage, much of which is covered at speed and over appalling roads and even fields, the transport of drugs and medicine and not infrequently livestock and their owners, combine to give the veterinary surgeon's car a severe testing and a short life.

It is quite impossible for the distributor to appreciate how very severe is this usage. Unlike the doctor, the veterinary surgeon has to visit the vast majority of his patients. Even in an urban area only a small proportion of patients can attend the surgery, and the area covered by a town practitioner is very many times that covered by a doctor.

It is, therefore, extraordinary that a Government which advocates a planned economy should, in this age of rationing and multitudinous petty restrictions, fail to control that which is in shortest supply of all.

The decision to cut the supply of sheet-steel to motor-car manufacturers by 15 to 20 per cent. has greatly aggravated an already serious position.

There is no alternative but for the Government to reintroduce forthwith a permit system, with adequate safeguards to prevent abuse. Under such a system veterinary surgeons should, in the national interest, be given the highest degree of priority.

NATIONAL AGRICULTURAL ADVISORY SERVICE

Mr. W. P. Dodgson, Livestock Husbandry Advisory Officer for Wales, has been appointed Deputy Chief Livestock Husbandry Officer in the National Agricultural Advisory Service in succession to Mr. H. L. Shrimpton, M.C., who was appointed Chief Livestock Husbandry Officer on October 1st, 1950.

QUESTIONS AND ANSWERS

The submission of questions for inclusion in this column will be welcomed; they can relate to any aspect of veterinary work. For purposes of record, each question is numbered, and those submitting questions are required to furnish (not for publication) name and address. It is regretted that consideration cannot be given to questions for which solely a private reply is required.

Answers to readers' queries represent exclusively the personal opinions of the writers, and criticism of the replies will be appreciated.

All communications should be addressed to the Editor.

Knuckling of Fetlock Joint in Newly Born Calves

Q. 371.—*What information can you give on the following features of this condition :—*

(*a*) *Causation.*
(*b*) *Pathology and lesions.*
(*c*) *Breed distribution?*

A.—This is one of those conditions about which there is a dearth of real knowledge. It occurs in all breeds of cattle and in most breeds of horses, although very rarely in the pony breeds. It is generally assumed to be due to atony of the extensors of the digit, but since the opposite condition, in which the calf appears to be suffering from rupture of the flexor tendons, is not uncommon, it is most probable that in both conditions general muscular tonus is abnormal and that depending upon whether the flexor group or the extensor group is the more affected, so there may be knuckling forward at the fetlock or a " dropped fetlock."

On dissection no lesions can be discovered but the affected muscles may appear paler in colour than normal. Sections show no abnormality, and the conclusion is that the disability is functional rather than organic.

There is no generally recognised cause, but since many calves respond rapidly after intramuscular injections of vitamin D_2 or vitamin E, the view has been held that a myodystrophia due to inadequacy of vitamins D and E during foetal life may be associated with the origin of the condition.

On the other hand, many (perhaps most) calves will recover spontaneously, provided they are otherwise normal, and are managed in accordance with good principles. Rarely, extension splints have been used with, it is claimed, good results in severe cases. Such references as there are in literature are nearly as vague and indefinite as the above reply !

. . . . .

Indolent Ulceration of the Muzzle

Q. 372 (*from Costa Rica.*)—*A six-year-old gelding cow-pony, light roan in colour and having a white face prone to constant blistering from the sun, sustained injuries from barbed wire in the region of the muzzle some 18 months ago. Despite prolonged treatment of antiseptic applications the wounds failed to heal. On examination the pony was found to have two indolent ulcers with considerable induration of the surrounding tissues.*

The larger ulcer lateral to the nostril shows satisfactory response to the application of caustic silver nitrate. The smaller ulcer, however, presents difficulty on account of its location which involves the lower lip a little anterior to the commissure. The ulcer apparently inconveniences the pony very little, but the surface frequently becomes abraded and haemorrhagic from foraging in rough pasture : naturally the use of a bit is precluded. The pony is broken to a hackamore, but as this gives inadequate control for stock work the owner is anxious that the animal be rendered fit for the use of a bit. I should appreciate any suggested lines of treatment in this case.

A.—As these two ulcers have such a long history, the respondent doubts if they will heal by ordinary measures, in any reasonable time. He would be inclined to excise and then dress the part with 2 per cent. gentian violet or scarlet red.

If surgery is not desired, then the above is quite a good dressing used alternately. Cod-liver oil should also be given internally.

. . . . .

Stone Eating in Dogs

Q. 373.—*Two pugs aged 12 months, in good condition and with no tendency to rickets, eat a large number of stones daily. They have been treated with vitamin and mineral preparations, but with no effect. Is it possible to cure these dogs, or has it just become a habit?*

A.—Stone eating generally commences in puppyhood, at or before the eruption of permanent teeth.

In the writer's view the initial causes may include any or all of the following :—

(1) Gum irritation during dental eruption leading to chewing of coal, stones, wood, etc., and accidental swallowing—also accidental swallowing during play.

(2) Digestive disturbance due to internal parasites, unsuitability in type and bulk of food, etc.

(3) Possible actual dietetic deficiencies or imbalance.

(4) General disease, *e.g.*, puppies and older dogs in the course of hard pad disease have been observed to eat earth out of plant pots kept indoors.

Once stone eating has commenced the presence of stones and their constant passage is sufficient to maintain a digestive disturbance which may lead to continued habit.

In adult dogs with no obvious dietetic deficiency or imbalance and no specific disease the primary essentials in treatment would appear to be :—

(1) Complete removal of those stones already present. Bulky feeding, good fluid intake and the administration of a water absorbent bulk laxative, *e.g.*, " Vi Siblin " (Parke, Davis & Co.), are very useful in hastening intestinal passage of stones.

Consider X-ray of stomach in severe cases to find if all have been passed on.

(2) Absolute prevention of intake over a fairly long period. The dogs should be taken out only on a lead and not allowed to run in the garden unaccompanied.

(3) Treatment of any remaining digestive trouble. Treat for parasites if present. If not, a simple mist. bismuth has been found effective in some cases in preventing the desire to eat stones once those already swallowed had been passed, vomited or removed.

THE PATHOLOGY OF CAPTIVE WILD ANIMALS

At a pathological meeting of the Liverpool Medical Institution on Thursday, December 14th, Dr. R. E. Rewell, pathologist to the London Zoo, read a paper on " The Pathology of Captive Wild Animals " (reports the *British Medical Journal*). He said that the size, shape, and metabolism of cells was limited and controlled by factors independent of the dimensions and structure of the whole animal. Thus a granulosa-celled tumour of the ovary had the same structure and might show the same variations in a small monkey as in a woman, or as in a gigantic whale. However, such tumours could be found only in animals with Graafian follicles. Variation in the structure of organs conditioned local variations in the results produced by disease. Inflammation of the lung of a reptile, which has no closed spaces, produced a condition comparable to enteritis in mammals; the lung of a bird, with its " through and through " arrangement, became completely solid; while the numerous blind ends of a mammalian lung gave rise to the characteristic lobular consolidation. Differences in metabolism must be responsible for such things as the high incidence of Laennec's cirrhosis of the liver in the Arabian camel, not seen in the closely related Bactrian camel, though both are usually on the same diet while in a zoo. Skin boils in ungulates were due to a corynebacterium, while in Equidae arterial aneurysms were caused by the worm *Strongylus vulgaris*. Some of these pathological conditions might be useful in the selection of suitable experimental animals outside the range of those commonly employed.

ABSTRACTS

[Foot-and-Mouth Disease, with special reference to Important Facts and Problems Emphasised by the Current Outbreak in Mexico. KELSER, R. A. *Univ. Penn. Bull.* **50.** No. 28.]

During the past 50 years foot-and-mouth disease has made its appearance in the U.S. on only six occasions; the first was in 1902. This was quickly brought under control by the slaughter method. The most serious outbreak was in 1914–15, when 22 States were involved, 170,000 animals being slaughtered. The last outbreak was in California in 1919. Apparently this was introduced with ships' garbage, which contained meat trimmings. The author suggests that despite a lack of knowledge on the subject, the carrier problem is probably an important one and needs further investigation.

In 1946 against professional advice, Mexico imported Zebu bulls from Brazil, which resulted in the appearance of foot-and-mouth disease in that State.

The remainder of this article revolves largely round the circumstances of the outbreak in Mexico and is a general statement of fact. The virus of the Mexican outbreak, typed by Galloway in this country, proved to be of the Vallée "A" variety, but had some variant qualities of its own. Nevertheless, a European vaccine prepared against the true "A" type proved capable of immunising the cattle against the Mexican strain. The magnitude of the vaccine production programme can be visualised when it is realised that it requires one bovine to produce approximately 200 to 400 doses of vaccine. Evidence indicated that the duration of immunisation was not greater than four months, or revaccination occurred at this interval rather than the original six months' interval. The vaccine was a tongue tissue, formalin and heat inactivated product, containing aluminium hydroxide adsorption of the virus.

A challenge inoculation on the tongue was carried out to test the vaccine. Whilst this produced a remarkably severe reaction, generalisation of the disease is rare.

The failure of the Mexican campaign and the ultimate resort to vaccination is of some interest in that it reveals the importance of certain factors antagonistic to success. The nature of the country, the size and distribution of the susceptible animal population, the deficiency in methods of transport and the absence of suitable roads in many parts, made it difficult to bring the scheme rapidly into operation. In addition, there was also a shortage of skilled professional staff and suitable unskilled labour. The natural reaction of the populace was antagonistic to the introduction of strict regulations and whole-hearted support was not always forthcoming from official sources to ensure the proper carrying out of instructions.

N. S. B.

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[On the Evaluation of Bull Semen with special reference to its Employment for Artificial Insemination. (Trans. title.) BLOM, ERIK. (1950.) pp. 223. Copenhagen: A/S. Carl Fr. Mortensen.]

In his thesis for the Doctorate in Veterinary Science the author gives a comprehensive account of his investigations which began in 1942. He has attempted to find the bases upon which a laboratory could evaluate the fertility of a bull by the examination of its semen. The various tests and techniques he has employed in his experiments, together with the results he has obtained from them, are described fully and compared with those of other workers. Much of his own work has been published previously. A description of his "comparing chamber," a slide for the microscopical examination of semen, was published in the *Veterinary Journal* of 1946 (**102.** 254) and his method of staining spermatozoa with alkaline methyl violet appeared as an abstract in the *Veterinary Bulletin*, 1944 (**14.** 76). Both the "comparing chamber" and the method of staining have been used by the reviewer since their descriptions first were published and both deserve to be known more widely among British workers, as does the modified bromthymol blue-catalase test for contamination. The literature on the subject is comprehensively reviewed in the text and the bibliography covers ten pages. The illustrations, both diagrams and microphotographs, are excellent and are sufficient to cover the subject; the captions they carry are in English as well as Danish. An appendix of tables with notes on the history of the individual bulls investigated covers 41 pages and the headings of the tables are also in both languages.

Unfortunately little but the author's final conclusions can be gained from the English summary by the reader who is unfamiliar with Danish. It certainly gives little indication of the magnitude of the work or of the thoroughness with which the author has pursued it.

A. A. F.

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[The Use of New Insecticides in the Control of Ectoparasites. GRAHAM, N. P. H., & MONTGOMERY, I. W. (1949.) *Austral. Vet. Jour.* **25.** 239–248.]

This article is a review of current information on insecticides in general and particularly those which have recently come into veterinary use.

Earlier insecticides had a low margin of safety but more recent discoveries are relatively less toxic for the host than the parasite—this usually depends on differential absorption and availability rather than actual differences in toxicity.

DDT was the first of the more important synthetic insecticides to be discovered and was the first found to possess marked residual insecticidal activity. Two isomers occur, of which the para-para is the more active.

Benzene hexachloride (BHC)—a British discovery—owes its activity to its γ isomer ("Gammexane") content—the other three isomers lacking insecticidal activity. The γ isomer is present at about 13 per cent. in commercial BHC but higher concentrations can be prepared. Gammexane is also a persistent insecticide.

DDT was early proved of considerable value in Australia in the control of the buffalo fly (*Siphona exigna*).

In South Africa the arsenic resistant blue tick (*Boophilus decoloratus*) was found to be susceptible to high dilutions of Gammexane and in Britain cattle lice were found susceptible to very high dilutions of the γ isomer of BHC (Gammexane). When DDT was used against lice it was found to possess only about one-quarter the activity of Gammexane. The latter was proved to be lethal to the eggs of lice when used in higher concentrations and as a result of this and its persistent properties it can be used for the eradication of lice by one application.

The persistence of the new insecticides offers more reasonable hope of the eradication of some types of ectoparasites, particularly those which are permanent obligatory parasites.

Facultative parasites which can exist even in complete absence of the host can rarely be eradicated. The efficiency of the insecticide depends greatly on its formulation and method of application. Thus dusts are less easy to apply uniformly and so have to be used at higher concentration (and incidentally may be more dangerous) than liquid formulations.

Fumigants are little used in veterinary practice. Liquid suspensions may "settle" and application of the active principle may in consequence be uneven. Emulsions may be more satisfactory though with hard water may "break" and may not easily be redispersed.

The specific uses of the insecticides dealt with in this paper are classified under the animal hosts and may be summarised as follows :—

Cattle.—Against cattle ticks (*Boophilus*) 0·5 per cent. para-para DDT, or 0·05 per cent. γ isomer BHC, give good control. The former gives absolute protection for seven to ten days and a practical dipping period of five to six weeks. The latter gives absolute protection for about five days and a practical dipping period of four weeks. Neither of these insecticides affects the cattle whereas post-dipping scalding and malaise are common with arsenic.

Buffalo fly has been eradicated from properties where DDT has been used as a cattle dip.

Sheep.—0·1 per cent. para-para DDT, or 0·007 per cent. γ isomer of BHC, are effective as dips against keds (*Melophagus*) and body lice (*Demalinia bovis*). The sheep foot louse is killed by 0·007 per cent. γ isomer of BHC but sometimes re-infestation occurs. DDT is not so effective against foot lice.

For the prevention of blow-fly (body) strike dips and sprays of 0·5 per cent. DDT have given good results overseas but these have not been reproduced in Australia. In a few tests in Australia good results have been obtained with dips or sprays of 0·056 per cent. γ BHC and at half this concentration a fair degree of protection was obtained.

Preparations of 0·12 per cent. γ BHC prevent poll strike in rams and these and 1 per cent. DDT preparations have been used as fly dressings.

Swine.—The ectoparasitic infections of pigs, including sarcoptic scabies, are readily controlled with BHC.

Dogs and Cats.—Both insecticides act on fleas and lice and may be used as follows : DDT 5 per cent. in dust or 0·5 to 1 per cent. as a wash ; BHC (γ isomer) 0·1 per cent. in dust or 0·01 per cent. as a wash.

Against acari Gammexane should be used at a 0·1 per cent. concentration in ointment or oil base. Against the dog paralysis tick (*Ixodes holocyclus*) 0·1 per cent. γ isomer baths at weekly intervals give satisfactory protection ; 1 per cent. DDT may be as effective for the same purpose.

Poultry.—Both insecticides have been used against red mite, DDT at 0·5 per cent. in spray.

The stickfast flea (*Echidnophaga gallinacea*) is controlled at 5 per cent. DDT or 0·5 per cent. γ isomer dusts, or, preferably, 1 per cent. DDT or 0·1 per cent. isomer dips.

A number of references are given ; one author is, however, referred to under differently spelt surnames with different sets of initials !

J. S. S.

U.S.A. REPRESENTATION AT INTERNATIONAL HORSE SHOWS, ETC.

The current issue of *Horse and Pony News* carries the following: "The U.S.A. Army having now been mechanised, and the cavalry disbanded, the usual method of utilising their horses and riders as the representatives of U.S.A. in Olympic Games and International Horse shows, has created concern among horse owners in that country.

"Accordingly an International Equestrian Competitions Corporation has been formed, with headquarters at 60, East 42nd Street, New York. The Chairman is Mr. Spencer Weed, and the President is Col. John W. Wofford, a former rider in the U.S.A. team. He will be in charge of the field work, and the actual selector of horses and riders.

"The whole country has been divided into ten zones, and the duty of each zone chairman will be to find men or women amateurs who have the time, who are willing to train and who have horses on which they can display their equestrian ability in a competition to be held in each zone."

REVIEW

[Linton's "Animal Nutrition & Veterinary Dietetics." Third edition (1950) by Dr. J. T. Abrams. Edinburgh : W. Green & Son, Ltd. Price 42s.]

A comparison of the first edition of this book, published in 1927, with this the third edition well illustrates the enormous changes which have been made in the nutritional knowledge veterinary surgeons must possess. The new edition of course is over 100 pages larger but it is rather in quality than in quantity that the changes have occurred. A far greater knowledge of the chemical composition of foodstuffs as well as of the individual constituents such as the vitamins is now required. In a way the new chapter on the vitamins with its description of the physiological properties of at least 16 different entities, many of known chemical composition, as opposed to the loose and brief descriptions of these properties for only five vitamins, typifies the advances almost as clearly as any other section. But every other section shows important progress in knowledge. A matter of considerable importance is the varying qualities with age of forage crops such as grass. The value of lucerne as a feeding stuff is more clearly brought out although perhaps even yet not emphasised enough. Such foods as swill, penicillin mat and seaweed are also dealt with, whilst the table in the appendix giving the chemical composition and nutritive value of most animal feeding-stuffs has now extended from eight to 18 pages. Altogether, the text offers a much sounder basis for veterinary dietetics than the previous edition and can be strongly recommended to veterinary graduates and students.

The work, however, appears to have lost something of its practical application to veterinary affairs, for matter that has proved of value to those trying to rectify troubles of dietetic origin has been omitted. Previously greater help was given on possible toxic constituents or on the appearance of grasses, etc., that might be found in hay. Admittedly the plates illustrating grasses have been discarded for other informative plates upon certain deficiency diseases and upon the effect of the plane of nutrition on carcase quality. Nevertheless, it might have been helpful to retain and even extend the number of plates and illustrations referring to these practical matters of recognition which are almost unknown to the average town-bred veterinary student of to-day. Indeed, in some ways the book could be considerably improved by illustration throughout the text.

On the other hand, the additional sections on the basic needs of livestock for maintenance, growth, reproduction, lactation and work dealt with from the general point of view, on goats, on small domesticated carnivora and on laboratory animals, as well as many references to original papers at the end of chapters greatly enhance the value of the book to its serious user.

In conclusion, the reviewer wishes to repeat that the book is much improved for the purposes of modern teaching and should prove valuable to all members of the veterinary profession.

Weekly Wisdom

Despotism when looked at from without usually looks solid and formidable, whereas free societies look divided and weak. Actually, that is an optical illusion. The reality is just the opposite.—John Foster Dulles, Republican Adviser to the State Department, addressing the American Association for the United Nations.

REPORT

[**National Institute for Research in Dairying:** Report for the Year 1949.]

In our search for understanding of many of the problems in the field of animal disease, it is impossible to move far without impinging upon the environment and climate in which the animal is existing and a study of the factors which go to make this environment is all important. Much interesting work on these factors has been and is being carried out at the National Institute for Research in Dairying and is recorded in brief in their Annual Report for 1949.

One need only mention such problems as the factors affecting the efficiency of food utilisation by ruminants, which involve a study of the rate of passage of certain foods through, and the extent of digestion in, the different stomachs; the pre-milking of cows; the stimulation of milk production by thyroid active substances; and oestrogenic factors in grasses. In regard to the last-mentioned, concentration seems to be greater in the early spring, first in the leaf and afterwards in the flowering stalk. Broad Red Clover, however, was found to be active throughout the year. Work on the nutritional significance of colostrum showed that calves given a diet of skimmed milk supplemented with vitamin A, fared much better and retained more vitamin A when soya-bean lecithin was added to the diet. Studies on the site of conversion of carotene to vitamin A showed this to be actually in the wall of the intestine. Observations were made upon the effect of a vitamin A deficient diet on piglets. Brief records are also given of a considerable amount of other work being carried out in the Departments of Nutrition, Bacteriology, Dairy Engineering, etc. N. S. B.

NOTES AND NEWS

Diary of Events

Jan. 26th.—Annual General Meeting of the Yorkshire Division, N.V.M.A., at Leeds (Great Northern Station Hotel), 2.30 p.m.

Jan. 26th.—North Wales Division, N.V.M.A. Dinner-Dance, at the Waterloo Hotel, Bettws-y-Coed, 7 p.m.

Jan. 27th.—Meeting of the Biochemical Society, in the Post-graduate Medical School, Ducane Road, London, W.12, 10.30 a.m.

Jan. 27th.—Meeting of the British Association of Allergists, at the Royal Society of Medicine, 1, Wimpole Street, W.1, 2.30 p.m. (Discussion on Veterinary and Comparative Allergy).

Jan. 30th.—Meeting of the Western Counties Division, N.V.M.A., at Exeter (Royal Clarence Hotel), 2 p.m.

Jan. 31st.—Royal (Dick) Veterinary College Annual Ball, in the Assembly Rooms, George Street, Edinburgh, 8.30 p.m.

Jan. 31st.—Meeting of the West of Scotland Division, N.V.M.A., in the Glasgow University Veterinary School, 2.30 p.m.

Feb. 1st.—Meeting of the Southern Counties Division, N.V.M.A., at Bournemouth (Grand Hotel), 6 p.m.

Feb. 2nd.—Annual General Meeting of the North of Ireland Veterinary Medical Association at the Veterinary Research Division, Stormont, Belfast, 2.15 p.m.

Feb. 7th.—Meeting of the Lancashire Division, N.V.M.A., at the Veterinary Hospital, Liverpool, 2.30 p.m.

Feb. 22nd.—Annual General Meeting of the South-Eastern Division, N.V.M.A., at Maidstone (Royal Star Hotel), 2.30 p.m.

QUARTERLY MEETINGS OF COUNCIL AND STANDING COMMITTEES N.V.M.A. DURING 1951

The following dates have been fixed for meetings next year, chiefly to give members plenty of time to reserve hotel accommodation

IN LONDON

Monday, January 22nd:
2.30 p.m. Parliamentary and Public Relations Committee.
3.30 p.m. Veterinary State Medicine Committee.

Tuesday, January 23rd:
10 a.m. Home Appointments Committee.
11.30 a.m. Organising Committee.
2.15 p.m. General Purposes and Finance Committee.

Wednesday, January 24th:
11 a.m. Council.

IN LONDON

Monday, April 16th:
2 p.m. Organising Committee
4 p.m Parliamentary and Public Relations Committee.

Tuesday, April 17th:
10 a.m. Veterinary State Medicine Committee.
12 noon Home Appointments Committee.
2.15 p.m. General Purposes and Finance Committee.

Wednesday, April 18th:
11 a.m. Council

IN EDINBURGH

Wednesday, July 11th:
11 a.m. Home Appointments Committee.
2 p.m Organising Committee.
4 p.m. Parliamentary and Public Relations Committee.

Thursday, July 12th:
11 a.m. Veterinary State Medicine Committee.
2 p.m. General Purposes and Finance Committee.

Friday, July 13th:
11 a.m. Council.

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R.C.V.S. OBITUARY

HUGHES, Richard, Brynoswallt, Queen's Road, Oswestry, Salop. Graduated Glasgow, April 13th, 1880; Fellowship April 26th, 1893. Died at Oswestry, after a long illness, January 10th, 1951; aged 94 years.

Mr. Richard Hughes, F.R.C.V.S. (1856-1951)

FIRST HONORARY LIFE MEMBER OF THE N.V.M.A.

It was but at last year's annual meeting of the N.V.M.A., at Cardiff in September, that the supreme worth of Richard Hughes, both as a man and as a veterinarian who, as was then said, gained the expressed recognition of Sir John M'Fadyean as the outstanding cattle practitioner of his time, was accorded the well-merited distinction of initiating the Association's roll of Honorary Life Members. The loss of so gracious a personality, venerated alike by his colleagues and by the members of the community amongst whom he lived, from 1882 in practice at Willow Street, Oswestry, until he entered upon 20 years of happy, useful retirement, will be mourned throughout the profession he adorned.

Born at Plasclocaen Farm, near Ruthin, on March 30th, 1856, the son of Mr. and Mrs. Hugh Hughes, he was sent to the British School at Corwen, and later went to Salop School, Oswestry. Being a farmer's son he had from his early youth a liking for the veterinary profession. It was the custom in those days for medical and veterinary pupils to serve an apprenticeship before going to college, and Richard Hughes served his apprenticeship with Mr. James Storrar, veterinary surgeon, Chester. When his apprenticeship ended, Mr. Storrar recommended the Glasgow College to Richard Hughes and to his own son Jim for training: they entered together in October, 1876, for the three-year course.

As a result of his studies there, he was First Prizeman in chemistry, pharmacology, medicine (practical and theory), and surgery (practical and theory), and he passed all his professional examinations with honours.

On qualifying, one of the examiners, Mr. B. Cartlege, of Sheffield, asked him to become his assistant, and he was there two years.

It was in March, 1882, that Mr. Hughes, knowing Oswestry district to be noted for the excellent quality of its livestock, ventured to start a veterinary practice there, and he set up his surgery at 26, Willow Street. There he worked hard and for long hours, and established a fine practice. During that period Mr. Hughes concentrated his practice within a radius of ten miles of the town, but also went out into Cheshire and the Border counties, so much were his services in demand. He was in charge of Oswestry Corporation Cattle Market as veterinary officer from 1884.

Mr. Hughes retired from his practice in 1926 in favour of his

son, Mr. H. Tudor Hughes, who carried on the tradition of service to the profession inaugurated by his father: the former as an outstanding R.C.V.S. examiner and member of Council, N.V.M.A., the latter as an able and diligent member of Council of the Royal College, for many years. In 1942 came the great blow, to his father and to the profession, of the death of Tudor Hughes. Bravely and cheerfully Richard Hughes continued, when called upon, to find solace in a continuation, at the more leisurely tempo demanded by age, of the happy life he had spent amongst his clients, so many of whom were reluctant to relinquish his services on his retirement.

Ever since his arrival at Oswestry, Mr. Hughes was associated with Oswald Road Presbyterian Church, while he never ceased to take a prominent part in the agricultural and communal life of the town and district.

One of his daughters is the wife of Dr. Gwilym Arthur Edwards, late Principal of the Aberystwyth Theological College. Mr. Hughes' sister—Miss Dolwen Hughes—lives at Oswestry; she is 90 years old. Miss Kate Hughes, his other daughter, also is left to mourn his passing, and to them we extend deep sympathy in their loss.

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PERSONAL

Birth.—PRESCOTT.—On January 1st, 1951, at Kongwa Hospital, Tanganyika Territory, to Mr. and Mrs. J. Graham Prescott, a daughter—Katherine Margaret.

. . . . .

Marriage.—CORMACK—WHITE.—On Thursday, December 21st, 1950, at St. Andrew's Cathedral, Aberdeen, James George Cormack, M.R.C.V.S., younger son of Mr. and Mrs. A. C. Cormack, 53, Andersen Drive, Aberdeen, to Heather, youngest daughter of the late Mr. G. White and of Mrs. White, 23, Chattan Place, Aberdeen.

COUSENS—TURNER.—The wedding of Patricia Joan Turner, M.R.C.V.S., to Capt. Donald Cousens, R.A.V.C., took place at Christ Church, Cockfosters, on December 30th, 1950. The reception was held at West Lodge Park Hotel, Hadley Wood, and among the guests present were the following members of the profession:—Misses V. Stockwell and A. Sutherland, Councillor E. P. Offord, and Messrs. J. E. M. Ridge and S. S. Nye.

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NATIONAL COUNCIL FOR DOMESTIC FOOD PRODUCTION

The Minister of Agriculture and Fisheries has appointed a National Council for Domestic Food Production under the chairmanship of Mr. George Brown, Joint Parliamentary Secretary to the Minister. This step follows a recommendation in the report published last May of the Committee on the Organisation of Domestic Food Producers under the chairmanship of Mr. Brown.

The Council's terms of reference are to co-ordinate the work of the various national organisations in domestic food production in England and Wales; to consider measures for its development and encouragement; and to examine and advise on any proposals for Government assistance, financial or otherwise, and generally to advise the Minister in the national interest on all matters relating to domestic food production.

It will be recalled (General Secretary's Annual Report, 1949-50, page 40) that the N.V.M.A. expressed to the Minister the hope that in selecting his nominees for appointment to the National Council, he would include one member from the ranks of the Association, having regard to the importance of hygiene and good husbandry in the keeping of small livestock. This suggestion having commended itself to him, the Minister invited names, and we are pleased to note the inclusion of that of Miss J. O. Joshua, F.R.C.V.S., in the membership of the Council. The remaining members are:—Mr. G. A. Brown, M.P., Joint Parliamentary Secretary to the Ministry of Agriculture and Fisheries (Chairman), Mr. A. S. H. Dicker, F.C.A., Mr. Cedric Drewe, M.P. (Chairman of the Small Pig Keepers' Council), Mr. G. W. Giles, O.B.E., F.R.H.S., Mr. T. H. Hodgson, O.B.E., Mr. H. G. Holliday, F.R.H.S., Mrs. F. C. Jenkins, C.B.E., Mr. D. L. Jones, O.B.E., Mr. T. W. Palmer (Chairman of the British Goat Society), Mr. W. L. Platts, F.S.A., Miss M. Rotherham, O.B.E., Mr. F. Russell (Secretary of the Small Pig Keepers' Council), Mr. R. Sudell, F.INST.L.A., Mr. G. H. Sylvester, M.A., Mr. P. C. Thornton and Mr. W. H. Vaughan, O.B.E. Further members of the Council will be appointed when nominations have been received from the British Rabbit Council and the Domestic Poultry Keepers' Council. Members will serve for a period of three years from the date of appointment.

Representatives from the Ministries of Agriculture and Fisheries, Education, Food and Health will attend the meetings of the Council as Assessors.

Mr. R. F. Giles has been appointed Secretary, and Mr. A. J. Edney Assistant Secretary of the Council, and communications should be addressed to the Secretary, National Council for Domestic Food Production, Ministry of Agriculture and Fisheries, 28 to 32, Chester Terrace, London, N.W.1.

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HILL FARMING ADVISORY COMMITTEE FOR ENGLAND, WALES AND NORTHERN IRELAND

The first term of office of the Advisory Committee for England, Wales and Northern Ireland, appointed by the Minister of Agriculture and Fisheries under the Hill Farming Act, 1946, having expired, the Minister has reconstituted the Committee and has appointed the following to be members for a period of three years from December 30th, 1950:—The Rt. Hon. the Earl of Listowel, P.C. (Chairman), His Grace the Duke of Northumberland (Deputy Chairman),* Major C. A. M. Alexander, M.C., D.L., J.P.,* Mr. J. V. Allen, J.P.,* Mr. C. J. Chilman, Mr. L. Y. Dent,* Mr. C. Kenyon, J.P., M.P.,* Mr. David Lewis, M.B.E., J.P.,* Mr. Harry Lewis, J.P.,* Professor Wm. C. Miller, M.R.C.V.S., F.R.S.E.,* Professor J. E. Nichols, M.SC., PH.D., F.R.S.E.,* Mr. Evan Roberts, J.P., Mr. C. Scott, Mr. C. F. Thomas, Professor R. W. Wheldon, F.R.S.E., D.SC.,* Mr. E. Williams, Mr. W. Witson* and Colonel J. C. Wynne Finch, M.C., J.P.*

Mr. J. H. Perrin has been appointed to act as Secretary to the Committee, and all communications should be addressed to him at the Ministry of Agriculture and Fisheries, 14 to 21, Chester Terrace, Regent's Park, London, N.W.1.

* These members have been reappointed.

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ROYAL (DICK) VETERINARY COLLEGE

Proposed Transfer to the University of Edinburgh

To give effect to a proposed transfer of the control of the Royal (Dick) Veterinary College from Edinburgh Corporation to Edinburgh University is the purpose of a Provisional Order now being promoted.

The College was founded in 1823 by Professor William Dick, and following his death it was for many years carried on by the Lord Provost, Magistrates and Council of Edinburgh as trustees. Since 1906 the College has been administered by a board comprising, amongst others, persons elected by the Corporation, the University, and the Highland and Agricultural Society of Scotland.

With a view to making "better provision for the teaching of veterinary students" an agreement was recently entered into between the board and the University Court for embodying the College within the University, dissolving the board, and transferring the heritable and moveable assets and endowments of the College to the University Court.

The schedule to the Order now before Parliament to give effect to the above purposes shows that the University Court have undertaken to promote ordinances providing for the institution of a degree or degrees in veterinary medicine and surgery and for the institution, as soon as conveniently may be after the embodiment of the College within the University, of Chairs in veterinary surgery, veterinary medicine and veterinary hygiene and preventive medicine. Reference to provision for staff to be given placings on the University salary scales is followed by additional undertakings: "To take over the veterinary practice at present belonging to the College and situated at Dalkeith, together with the clinical practices of the College, and to make provision that the free revenue from the foresaid veterinary practice and clinical practices and from the various diagnostic laboratories of the College shall be made available for use within the University Veterinary School"; "To provide that the following endowments, namely—the Alexander Inglis MacCallum Endowment and the Mary Dick Endowment—shall continue to be utilised for the specific purposes originally stipulated in the Trust Deeds"; "To associate the name of Dick with the Veterinary School within the University, retaining, if possible, the designation 'Royal'," and "To assume all interests and obligations of the College in the Edinburgh Centre of Rural Economy."

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"P.J. Poisons Guide."—Over 200 additions and alterations have been made to the "P.J. Poisons Guide and Extended Poisons List." Copies of the list of amendments can be obtained from the Pharmaceutical Press, 17, Bloomsbury Square, London, W.C.1, by sending a stamped addressed envelope. If the "P.J. Poisons Guide" is required, a remittance for 3s. (interleaved copies, 3s. 6d.) should be enclosed

FOWL PEST

Poultry Association's Request for Cessation of Imports

The Poultry Association of Great Britain stated last week that, in view of the fowl pest position, it had again asked the Minister of Agriculture to bring before the Cabinet the imperative need for the cessation of imports of poultry meat that might possibly be infected with fowl pest, no matter from what source and for whose use. The association claimed that unless such imports were stopped any reduction in the outbreak could never be permanently maintained. A copy of the communication was also sent to the Secretary of State for Scotland.

Another outbreak of fowl pest was reported in Shropshire on Sunday last, when first cases were confirmed in Worcestershire and the East Riding of Yorkshire. Twelve pullets which were delivered from the south of England to a farm at Ilam, near Leek, Staffordshire, were found to be suffering from fowl pest and were destroyed, together with 200 breeding turkeys, geese and ducks already on the farm.

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ADDRESSES OF DISEASE-INFECTED PREMISES

The list given below indicates, first, the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

Swine Fever:

Derbys.—Manor Farm, Oakerthorpe, Derby (Jan. 8th); 94, Bakestone Moor, Whitwell, Worksop (Jan. 11th).

Devon.—Dawn Coppice, Liverton, Ilsington, Newton Abbot, Devon (Jan. 9th).

Lanarks.—94, Carntynehall Road, Glasgow (Jan. 8th); 194, Hamilton Road, Cambuslang, Glasgow. (Carcase at Emergency Slaughterhouse, Melbourne Street, Glasgow) (Jan. 12th).

Lancs.—Piggery rear of Cemetery Road, Kearsley, Lancs (Jan. 10th).

Lincs (*Lindsey*).—East Kirkby, Spilsby, Lincs (Jan. 8th); 65, Henderson Circle, Scunthorpe, Lincs (Jan. 13th).

Notts.—Willow Farm, Bole, Retford (Jan. 11th).

Yorks (*E.R.*).—Mount Pleasant Farm, Aldborough, Hull, Yorks (Jan. 8th); Turmer Hall, Ganstead, Beverley, Yorks (Jan. 10th); White House Farm, Elvington, York (Jan. 11th).

Yorks (*N.R.*).—Hall Farm, Osgodby Lane, Cayton, Scarborough (Jan. 10th).

Yorks (*W.R.*).—Martins Allotments, Stoneyford Road, Wombwell, Barnsley, Yorks (Jan. 8th); Warp Farm, Moorends, Thorne, Doncaster (Jan. 10th); 48, York Street, Mexborough, Yorks (I.P. Brickyard Allotments, Mexborough) (Jan. 13th).

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Factors Affecting Fertility in Cattle

Discussion of factors affecting fertility, both as an individual and as a herd problem, formed an important feature of the course recently held at Cambridge by the Cattle Breeders' Club, who devoted a whole day to it. *The Farmers' Weekly* records that the opening paper in this section was given by Mr. S. L. Hignett, of the Wellcome Research Institute. Referring to his theory of a lack of balance between an animal's calcium and phosphorus intake as a cause of infertility, Mr. Hignett emphasised that he must not be regarded as being opposed to leys. He was farming over 300 acres himself, and he had more leys, more lucerne and used more lime than anyone else in the district. A lot of the trouble had been due to the fact that farmers had expected too much of their leys. Leys provided for protein and carbohydrate. Few leys could provide the amount of phosphorus he considered was necessary for the animal. It was not uncommon to find ley herbage with 0·6 per cent. of phosphorus and 0·8 per cent. was quite a good figure. As a result of a survey of herds he had come to the conclusion that to get a conception rate of 66 per cent. the cow must receive 20 to 40 grammes of P_2O_5 in excess of the standard of 23 grammes for maintenance and 19 grammes for each gallon of milk laid down by the Ministry of Agriculture.

The Ministry's ration was insufficient for high fertility. It was based on range conditions overseas where the number of services a cow received was of less importance than the number of calves at the next marking. An excess of calcium could interfere with the utilisation of phosphorus (and some believed of iodine). The calcium intake of the dairy cow was far in excess of what it was 15 years ago. But, important as the subject was, he could not say that the calcium-phosphorus factor was the most important one in infertility.

Mr. Geo. N. Gould (Southampton) urged that the subject of infertility should be viewed in its right perspective. Ten years ago a veterinary survey committee had been set up to assess the problem and as a result they found that approximately 80 per cent. of infertility was associated with infection and 20 per cent. with physiological conditions. "I am assured that infertility to-day is as great as it was ten years ago," said Mr. Gould. "If that is so, the veterinary profession has been wasting its time for ten years. The infertility problem to-day, as the result of efforts by the veterinary surgeon and the farmer, has been reduced." The picture had changed. Ten years ago it was agreed that contagious abortion was the disease which caused the greatest degree of infertility. The extensive vaccination programme following the introduction of strain 19 had undoubtedly reduced infertility associated with brucella infection, but we must not shut our eyes to the fact that in the past eight years only 3,500,000 animals had been vaccinated, so that, with a cattle population of 8,000,000, there were a terrific number of unprotected cattle in the country. Thus, there must be throughout the country herds in which brucella infection was still doing the damage it did in 1940. Another factor was farmers who vaccinated one, two and three years and then stopped. Brucella infection masked other infections—trichomoniasis, possibly *Vibrio foetus*, and probably abortion due to physiological causes.

In the case of the small herd, the introduction of A.I. had coped with the problem of trichomoniasis, but the retention of old bulls in pedigree herds made him wonder why some measure of bull hygiene was not adopted. He also stressed the importance of hygiene in calving and handling the foetal membranes.

He did not believe that *Vibrio foetus* infection was always venereal. Trials were going on at Weybridge to see whether the disease could be transmitted by the mouth.

He found it hard to accept that the clinical condition associated with phosphorus imbalance was of very widespread importance in this country, although it could possibly be important in exceptional circumstances.

Mr. Gould concluded with the following advice to farmers: (1) keep breeding records; (2) never serve a cow which is showing irregular oestrus, and (3) do not serve a cow showing an abnormal discharge.

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"A Century of Medical and Veterinary Mycology in Britain"

At the annual general meeting of the British Mycological Society held in London on December 2nd, 1950, the retiring President, Dr. G. C. Ainsworth, gave an address entitled "A Century of Medical and Veterinary Mycology in Britain." After tracing the beginnings of medical and veterinary mycology in Europe a little more than 100 years ago and outlining the development of studies on dermatomycoses and systemic mycoses of man in this country, Dr. Ainsworth said of mycotic diseases in animals:

"The first mycosis of animals to be recognised was 'muscardine' disease of silkworms in 1835. Even before that fungi had been noted in association with vertebrates. 'Salmon disease' appears to have the longest ancestry of any animal mycosis in this country since on May 12th, 1748, Henry Baker communicated to the Royal Society of London a letter he had recently received from William Arderon, of Norwich, describing observations on a fatal distemper of roach in captivity. '. . . after this Fish has been a little while confined, the finny Part of its Tail begins to drop off Piece by Piece; and when the finny Part is all gone, a sort of Mortification seizes upon the Tail itself, and gradually creeps along until it reaches the Intestines, at which time the Fish immediately dies'; so wrote Arderon, who also described and figured the 'fine fibrillous Substance' which grew out from the mortified tissues. J. H. Bennett in 1842 noted a similar growth on a goldfish, but the first British records of this disease to be of mycological significance are among those resulting from the serious outbreak of disease among salmon in the rivers Conway and Tweed in 1877. Worthington G. Smith in the *Gardeners' Chronicle* for 1878 attributed the disease to *Saprolegnia ferax*. T. H. Huxley in 1882, in an excursion into mycology as one of Her Majesty's Inspectors of Fisheries, identified the parasite as *S. monoica*. There are other more recent records of this not uncommon disease of fish and fish eggs but the relation of the pathogen to *S. parasitica* described by Coker in North America is still obscure and the disease, which is of economic importance, merits re-investigation.

"Another disease to be recognised more than 100 years ago is aspergillosis in birds (caused by *Aspergillus fumigatus* Fresen, and occasionally other species). It was in 1832 that Richard Owen when dissecting a flamingo found the 'vomicae' in the lungs to be lined with 'a green vegetable mould or *mucor*.' He recognised a parasitic relationship and concluded 'that internal parasites are

not derived exclusively from the animal kingdom' and 'that there are *Entophyta* as well as *Entozoa*.' Avian aspergillosis is probably the best-known mycosis of animals in Britain, or is at least the one most frequently correctly diagnosed. It is typically a disease of birds in captivity and takes an annual and not inconsiderable toll of birds in the gardens of the Zoological Society of London and of chickens and other poultry. Birds in the wild are said to be immune, or at least resistant, to aspergillosis but the evidence in support of this view is not very strong and there are a few good records of infections in wild birds.

"Actinomycosis was first recognised as lumpy jaw in cattle by O. Bollinger and his botanical colleague Carl Otto Harz, who introduced the name *Actinomyces* in the combination *Actinomyces bovis*. Unfortunately Harz had before him both actinomycosis and actinobacillosis (caused by *Actinobacillus lignieresi*) and, like many later workers, did not distinguish between the two conditions. *A. bovis* is now regarded as a *nomen confusum* and there is uncertainty about the name for the organism causing actinomycosis in cattle which is probably distinct from that responsible for human actinomycosis.

"Epizootic lymphangitis of horses and other equines which is endemic to countries surrounding the Mediterranean and prevalent elsewhere, was introduced into England and Ireland in 1902-3 by horses returning from the Boer War. In January, 1904, the Board of Agriculture and Fisheries drew the attention of local authorities to the dangers of this disease and in the April an Order was issued under the Diseases of Animals Acts. As a result, by isolation of infected animals and by slaughtering, the disease was eliminated within two years and it has not reappeared although it still has the distinction of being the only mycosis of man or animals subject to legal recognition in the United Kingdom. The causal organism is one of those fungi which exhibit dimorphism. On account of its yeast-like characters it was first classified as *Crytococcus farciminosus* but it is now referred to *Histoplasma* (as *H. farciminosum*) and Bullen, working at Cambridge, has recently determined the cultural conditions for the experimental mycelium-yeast transformation in this species.

"Mycoses of animals have in general received much less attention than have mycoses of man and it has frequently been the investigations of disease in man that have drawn attention to, or elucidated, disease in animals. This is particularly true of the dermatomycoses. Bennett (1842) drew attention to favus in mice but did not describe the fungus and it was not until the early years of the present century that Adamson confirmed for this country that *Achorion* [*Trichophyton*] *quinckeanum* infects both mice and men. Tilbury Fox's (1871) record of seven cases of ringworm in man contracted from a white pony constitutes the first case of equine ringworm, and three years later the same author recorded sycosis in a coachman caused by *Trichophyton mentagrophytes* originating from a horse. In 1908 Adamson recorded the same fungus contracted from calves causing body ringworm in man and about that time the Board of Agriculture issued Advisory Leaflets on ringworm in cattle and on favus in poultry. Favus in poultry is apparently a rare disease in Britain to-day but cattle ringworm is still widespread. In country districts, where *Microsporum canis* predominates over the human form, *M. audouini*, on the heads of children, *Trichophyton discoides* from cattle is the commonest cause of inflammatory body ringworm in adults."

The address concluded with a survey of recent developments in this country and the speaker pointed out that because of the increasing complexities of medicine, veterinary science, and mycology, rapid progress in the study of mycotic disease in man and animals can be achieved only by the collaboration of workers from the three fields.

CORRESPONDENCE

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the N.V.M.A.

ACETONAEMIA IN CATTLE

Sir,—Professor Carlström's paper and the accompanying discussion on the above subject (*Vet. Rec.*, 1950, **62**, 717) are of great interest. Professor Carlström has advanced a very intriguing theory, but it is open to criticism.

The basis of the hypothesis is that excessive production of prolactin, owing to its structural similarity to ACTH, involves reduced production of the latter. As Mr. Barker points out, this is difficult to understand, particularly in view of the, now, well-established fact that ACTH (or an adrenocortical extract) is essential, together with prolactin, for the initiation of lactation. Would it not be more reasonable to suppose that over-production of prolactin is associated with over-production of ACTH, and that the low potassium levels observed in Professor Carlström's experiments are indicative of hyper- rather than hypofunction of the adrenal cortex?

As a result of these experiments the conclusion has been drawn that the adrenocorticosteroids (11—deoxy-steroids) associated with electrolyte metabolism function in cattle in a manner exactly opposite to that in other species, while those concerned in carbohydrate and protein metabolism (11—oxygenated steroids) still behave in a manner analogous to that in other species. Differences in hormonal effect in various species may well be quantitative; it is hard to believe that qualitative differences of this kind exist.

The statement that "a low potassium concentration in the food would give rise to deficient function of the adrenal cortex" is unsubstantiated. Perhaps a confused analogy has been drawn with the "functional hypo-adrenalism" seen in man as a result of salt deficiency. This condition has been so called because the symptoms of asthenia and lassitude, readily responding to salt, closely resemble those of Addison's disease, but they are due to excessive loss of salt in the sweat and not to dysfunction of the adrenal cortex.

In any case it should be a relatively simple matter to establish the presence or absence of adrenal dysfunction in acetonaemia by estimation of urinary 17—ketosteroids, always provided that catabolism of adrenal cortical hormones follows the same pathways in cattle as in other species.

Hormonal considerations aside, it is not difficult to agree with Professor Carlström that acetonaemia may well be associated with disturbances of the ruminal flora. This theory has always received considerable support and will probably be re-examined more closely following the recent discovery that iso-propyl alcohol is found in considerable amounts in the blood, milk and ruminal contents of cattle suffering from acetonaemia (Robertson, A., Thin, C., & Stirling, Ann M., 1950, *Nature*, **166**, 954). It is less easy to agree with his statement that "any food which is deficient in those vitamins and enzymes which influence carbohydrate metabolism is in all probability likely to provoke the appearance of acetonaemia," for, presumably, the vitamins, and, certainly, the enzymes, would be destroyed in any case during ruminal digestion.

In this connection, Mr. Smythe asserts that "completely mismanaged, it (the rumen) is capable of producing anti-vitamins." It would be most interesting to have the evidence.

There appears to be a good deal of misunderstanding about the carbohydrate metabolism of ruminants. Whatever the supply of carbohydrate in the diet, very little will be absorbed as such, and, in fact, the only product of carbohydrate fermentation definitely known to be a glycogen precursor in the body is propionic acid; the position of acetic acid is still equivocal. It is for this reason that, as Dr. Holmes says, "the ruminant is predisposed to ketosis."

It is becoming increasingly evident that acetate plays a major part as an essential metabolite in many species, but particularly in the ruminant and that, in the latter, it may be as important as glucose both as a source of energy and as a precursor of milk products such as milk fat and lactose. The low blood sugar level in the normal animal and the fact that this level may be reduced, by injection of large amounts of insulin, to an extremely small value without producing hypoglycaemic symptoms also provide circumstantial evidence that glucose is relatively less important to the ruminant than to other species. Further, in acetonaemia, hypoglycaemia is not a constant finding; indeed, the animal may be hyperglycaemic. These facts are not accounted for by Dr. Holmes's theory as it stands.

Professor Carlström's hypothesis may be criticised further in that it cannot account for the acetonaemia accompanying pregnancy toxaemia in the ewe. Surely puerperal acetonaemia and pregnancy toxaemia are intimately related. In the one case, the animal, as Mr. Smythe says, is subjected to the strain of heavy milk production and, in the other, to the usual stresses of pregnancy accentuated in most cases by the presence of more than one foetus. Under such circumstances production of ACTH might well be stimulated with consequent hyperactivity of the adrenal cortex.

Is it not possible that acetonaemia is fundamentally due to overproduction of the pituitary growth hormone? This hormone has been shown to be highly galactopoietic (Cotes, P. M., Crichton, J. A., Folley, S. J., & Young, F. G. 1949, *Nature*, **164**, 992). It has also been shown to be diabetogenic and in this respect Cotes *et al.* (Cotes, P. M., Reid, E., & Young, F. G. 1949, *Nature*, **164**, 209) say "it is not unreasonable to assume that the diabetogenic action of growth hormone is the pathological outcome, exhibited in a limited number of species under certain conditions, of the excessive stimulation of those processes which may normally lead to an en-

hancement of growth rate." Further, Young (Young, F. G., 1947, *Brit. Med. Bull.*, **5**, 155) makes the observation that "growth, including foetal growth, and milk production are processes requiring a special type of metabolic control, in that they both necessitate the preservation from oxidation of foodstuff that would otherwise, in an animal in equilibrium, be oxidised." May not the acetonaemia of both cattle and sheep be the reflection of excessive inhibition of oxidation of glucose and/or acetate by tissues other than those associated with milk production and with foetal growth respectively?

Yours faithfully,

R. J. Garner.

The University of Liverpool,
Biochemistry Department,
Johnston Laboratories.
January 8th, 1951.

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PREGNANCY FOLLOWING CAESAREAN SECTION IN THE COW

Sir,—I read with surprise Mr. Milne's assertion that I had discarded the cutting of abdominal muscles in rumenotomy and caesarean sections, and I made haste to re-read my original article (*Vet. Rec.* **61**, 883), and I do feel that the contents of this article were a little ambiguous. May I quote the following: "a flank incision was made, the muscles being broken down instead of cut (a method now discarded in both rumenotomies and caesarean sections as being unsatisfactory as regards healing)."

At college I was taught the advantages of breaking down muscles compared with actual incision, but it was not until I was in practice that the many disadvantages of the former were made clear to me through experience, and I meant in my article that blunt dissection of muscle fibres had now been discarded by me in bovine abdominal operations.

Despite Mr. Farquharson's personal communication that three ceasarean sections had been performed on the same cow, it is my strong opinion—which I will alter only following definite clinical evidence—that a cow will not conceive in the horn that has suffered a caesarean section. I should have said that two caesarean sections on the same animal would have finished the breeding life of that cow and I should be most interested to hear from any veterinary surgeon, who has had pregnancy following a caesarean section, confirming the pregnant horn in future, rather than just reporting as Mr. N. R. Turnbull has done.

Yours faithfully,

Sidney S. Nye.

230, South Street,
Romford, Essex.
January 13th, 1950.

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REPAIR OF FRACTURES BY MODERN METHODS

Sir,—I have just received the December 16th issue of *The Veterinary Record* and read with interest the article by Hamilton Kirk, M.R.C.V.S., on "Repair of Fractures by Modern Methods."

I am fortunate in having held the position of Senior Veterinary Surgeon to an animal hospital in the U.S.A. for the past two years. It has fallen to my lot to operate by internal and external fixation on all suitable fracture cases coming in the practice and also on those of five neighbouring veterinarians. This has provided me with several such operations per week.

As there was nobody else in this area who had done this type of surgery, I was forced to experiment on my own. I do not doubt that many of my ideas are unorthodox; however, on the basis of my limited experience, I would like to mention some points of interest.

Mr. Hamilton Kirk states that he expects to be removing his pins in less than a month, and although I realise that this can sometimes be done without risk, I would say that it is a highly dangerous practice as a routine. It is simple enough to take the pins out, but putting them back is far from easy. I have made it a rule to leave the pins *in situ* until the line of fracture has disappeared from the callus in subsequent X-rays. This may occur at three to four weeks, but occasionally, especially in older dogs, it requires four months or more. It is, of course, important to remove the pins as early as possible in cases where a joint is immobilised. In certain instances, however, I have found evidence of ankylosis in less than three weeks.

In the normal run of patients I leave the pins *in situ* for six weeks. In complicated fractures, especially of the tibial shaft, and the trochanteric area of the femur, I use both intramedullary (screw-point) and Kirschner-Ehmer apparatus at the same time, taking off the Kirschner-Ehmer first and removing the intramedullary pin two weeks later. For multiple pelvic fractures repaired with Kirschner-Ehmer I do not remove the pins for two months at least.

I would recommend the use of bone grafts where possible in all dogs over seven years old, or those in poor health (as determined by clinical appearance and blood count prior to surgery). This is a simple enough technique and certainly induces a shorter healing time. (Bone is banked in sterile saline and kept in the freezing compartment of a refrigerator. The part preferred is the crest of the ilial wing, from dogs under one year old. I am unable to state how long these will remain viable, but to date I have used banked bone successfully after six months' storage.)

In general, I believe that the veterinary surgeon in practice would be well advised to leave the pins in a little longer. It is a good idea to warn clients of the symptoms of pressure atrophy and also to insist that they keep the pin bases clean to enable any seepage to escape. I feel a little more at ease if patients look in every fortnight or so to make sure that all the bolts are tight.

I had two cases last year which taught me a lesson. They were fully ambulatory and showed a fair callus at five weeks, whereupon I removed the pins. In both cases the callus broke down within one week and surgery had to be repeated. The second time I left the apparatus on for three months and in each case the outcome was excellent.

Yours faithfully,

D. A. Rickards.

Veterinary Medical Clinic of Aurora,
925, North Lake Street,
Aurora, Illinois, U.S.A.
January 11th, 1951.

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AN ERUPTIVE CONDITION AFFECTING MUCOUS SURFACES IN DOGS

Sir,—I should like to confirm, in part at least, the findings of the authors of the letter headed as above. I have seen personally only three cases, but they have all been during this last year. My identification of the lesion was confined to the discovery of the rectal lesions during routine examination of prostate and anal glands for vague and ill-defined symptoms in this region. I did not associate the rectal condition with lesions in any other part of the body and am grateful therefore for the information given. I am quite certain I have never felt this rectal lesion previously. As far as I can remember, none of the three cases was ill in any degree, and if the rectal condition was producing any upset, it must have been very slight. I distinctly remember doing nothing about it at all—a case of "out of sight, out of mind" perhaps. I am, however, at a loss to understand the authors' omission of any reference to vaginal lesions. Even assuming that it was a case of none having so far been discovered, which I presume is the correct interpretation, I cannot help but feel that their absence looks even queerer than if they had been present obviously.

Yours faithfully,

Alex. H. Hogg.

Blackburn,
Lancs.
January 6th, 1951.

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TREATMENT OF INFECTIOUS ORAL PAPILLOMATOSIS AND WARTS IN DOGS

Sir,—In reference to the clinical communication in your journal of January 6th, 1951, from Mr. Hamilton Kirk on persistent buccal warts and their treatment, I am writing to report the effective use of Anthiomaline (M & B). This is administered intramuscularly on alternate days till four to six injections have been given, in doses commencing from 1 c.c. and rising to 2½ c.c. by ½ c.c. doses.

It is my experience as lecturer in surgery in the Veterinary College at Madras that surgical removal of these growths is a poor and ineffective method, whereas Anthiomaline leaves nothing to be desired. The warts begin to shrivel out and separate at their base even during the course of treatment and disappear completely in 12 to 15 days' time. In my observation this agent is very safe, and cases treated similarly did not recur. In one case where the papillomatous growths were so numerous that the animal could not feed or close its mouth, surgical intervention was usefully combined with Anthiomaline injections.

I am sure that many practitioners in this country would have found this product of May & Baker's very useful in all such conditions.

I may add that Anthiomaline is effective also in the cutaneous warts of calves and of the udder and the teats in the cow, but in doses not yet standardised.

For a cow, 20 c.c. was injected intramuscularly during a week till five injections were given for warty udder and for a calf with skin warts 5 c.c. at intervals of two days.

It is my belief that the information furnished will be found to be useful, even though I am not able to present actual case records at the moment.

Yours faithfully,
M. N. Menon.

Royal (Dick) Veterinary College,
Edinburgh.
January 8th, 1951.

* * * * *

SODIUM BISMUTH TARTRATE SOLUTION IN THE TREATMENT OF BUCCAL WARTS IN THE DOG

Sir,—Reading Major Kirk's communication on the treatment of a stubborn case of buccal warts in a greyhound prompts me to report the following. I have been treating this complaint for about two years now with sodium bismuth tartrate solution (S.B.T. solution, C. J. Hewlett & Son). Originally, I began using this for the same reason that Major Kirk has been forced to use podophyllin in oil, namely, failure to get any response to other treatments. Similarly, I ran through several of the arsenical preparations and another bismuth injection (not bismuth salicylate, which I have personally never used) before I settled on S.B.T. solution. The dose rate I employ is 1 c.c. per week given by intramuscular injection. There have been no failures so far and the maximum number of injections used on any one case has been four. The average number per case is three. This compares favourably with the results published by Mr. R. Watson in 1943 with bismuth salicylate where the average number of injections required per case was four to six. S.B.T. solution also scores in that it is not an oily solution but is of a watery consistency. Its main application normally is in human medicine in the treatment of rheumatoid arthritis.

Yours faithfully,
Alex. H. Hogg.

Blackburn,
Lancs.
January 6th, 1951.

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A CATTLE BREEDING COURSE DISCUSSION

Sir,—At the fourth Annual Cattle Breeding Course held at Cambridge from January 2nd to January 5th this year a full morning was allotted to veterinary speakers. Mr. S. L. Hignett's instructive paper relating to herd fertility problems was enlarged upon by Dr. Laing, and Mr. Gould, in opening the discussion, modified Mr. Hignett's nutritional approach by re-focusing attention on the rôle of infective organisms. Even if those present had not fully appreciated the complexity of this infertility problem they were now well aware of it. However, I feel certain it appeared less formidable after listening to these three speakers.

Nevertheless, there must have been many who wished to draw on Mr. Hignett's wide experience of veterinary and agricultural problems. Unfortunately this was not possible as the discussion soon developed into a harangue between two veterinary members of the assembly. Now, to a veterinary audience, this would be most stimulating, but to livestock owners it can only have been confusing. Surely a gathering of farmers is not the place to air one's personal feuds—however friendly the latter may be.

Many of us have our own views on the problems connected with livestock, but so long as the layman is confronted with these in an unscientific and muddled way we cannot hope to gain his confidence. The help we give the farmer is enormous and the trust that so many of them have in their veterinary advisers shows this well. But we can do more, and in wider spheres. It is only by creating confidence that we can be of full benefit to the agricultural community and so maintain the place of the veterinarian in rural economy.

Yours faithfully,
R. A. Ayre-Smith.

"Caravans,"
Madingley Road,
Cambridge.
January 6th, 1951.

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R.C.V.S. COUNCIL MEETING IN DUBLIN

Sir,—On reading the Supplement to *The Veterinary Record* it is interesting to note that the Council of the R.C.V.S. held a meeting in Dublin on June 9th, 1950.

I regret that I can look upon the printed report as little more than a notification of the event. In the now long distant past one could glean some information from the reports of Council meetings as to the actions of the individual members. This was of assistance when one was called upon to register one's vote at election time. In the absence of such essential knowledge it is impossible to vote in a truly democratic manner.

These remarks do not apply to nominated members, for to the best of my knowledge the profession has no method of control over their actions.

Yours faithfully,
J. McCunn.

Larks Hall Farm,
Chingford, Essex.
December 17th, 1950.

[Facilities have been given to the Association by the R.C.V.S. Council for reporting its meetings. As regards the Irish meeting, both bodies desired to have a shorthand reporter present in Dublin, but unfortunately the arrangements broke down.—*Editor.*]

DISEASES OF ANIMALS ACTS, 1894 to 1937, and AGRICULTURE ACT, 1937 (PART IV).

Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period	Anthrax	Foot-and-mouth	Fowl Pest	Parasitic Mange*	Sheep Scab	Swine Fever
Nov. 6th to 30th, 1950	12	—	9	—	1	53
Corresponding period in—						
1949	11	2	17	—	—	—
1948	3	7	1	—	6	1
1947	7	—	268	—	2	1
Jan. 1st to Nov 30th, 1950	318	20	120	—	24	330
Corresponding period in—						
1949	217	15	558	—	24	5
1948	101	11	254	1	60	27
1947	111	103	2065	1	76	34
Dec. 1st to Dec. 15th 1950	13	—	13	—	2	46
Corresponding period in—						
1949 ...	7	—	16	—	8	—
1948 ...	9	1	5	—	4	—
1947 ...	4	—	109	—	10	
Jan. 1st to Dec. 15th, 1950	331	20	133	—	26	376
Corresponding period in—						
1949	224	15	574	—	42	5
1948	110	12	259	1	64	27
1947	115	103	2174	1	86	34

Note.—The figures for the current year are approximate only.

* Excluding outbreaks in Army Horses.

Tuberculosis (Attested Herds) Schemes

The number of Attested Herds, *i.e.*, herds officially certified as free from Tuberculosis as at November 30th, 1950, was as follows:—

England	Wales	Scotland	Total (Great Britain)
25,375	15,429	13,518	54,322

Advertiser's Announcement

Tetanus Antitoxin: New International Unit

Burroughs Wellcome & Co. announce henceforward all strengths and packings of 'Wellcome' brand Concentrated Tetanus Antitoxin (Veterinary) will be labelled in terms of the International Unit (1950).

The 1950 International Unit, which has been adopted by all member nations of the World Health Assembly, is twice as large as the existing International Unit. The same material measured by it contains half the number of units it contains when measured by the Standard of the previous Unit, now known as the International Unit (1928). Following is an example of the new labelling: 1,000 International Units (1950) (= 2,000 I.U. (1928)). The therapeutic value of any quantity of 'Wellcome' Concentrated Tetanus Antitoxin is not affected by this change in labelling.